Feb. 21, 1967 V. A. BURNHAM ET AL 3,304,583

WEB CONDENSER AND CALENDER

Filed Nov. 5, 1963 3 Sheets-Sheet 1

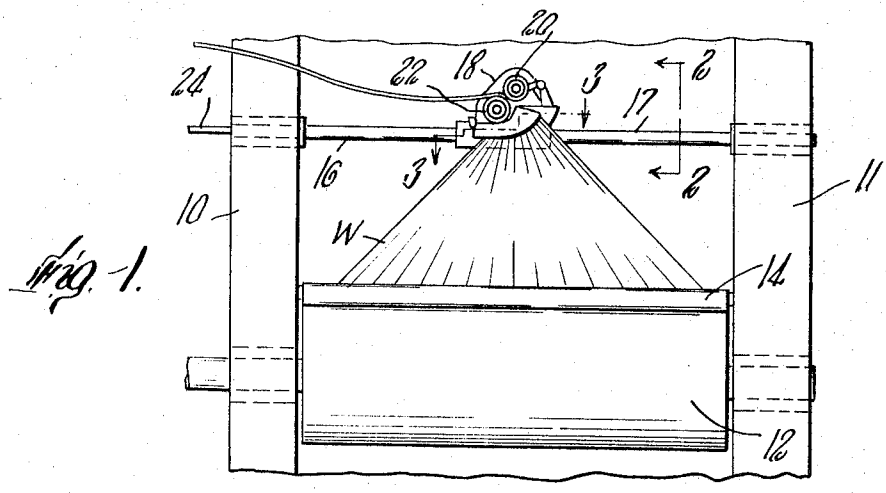

Fig. 1.

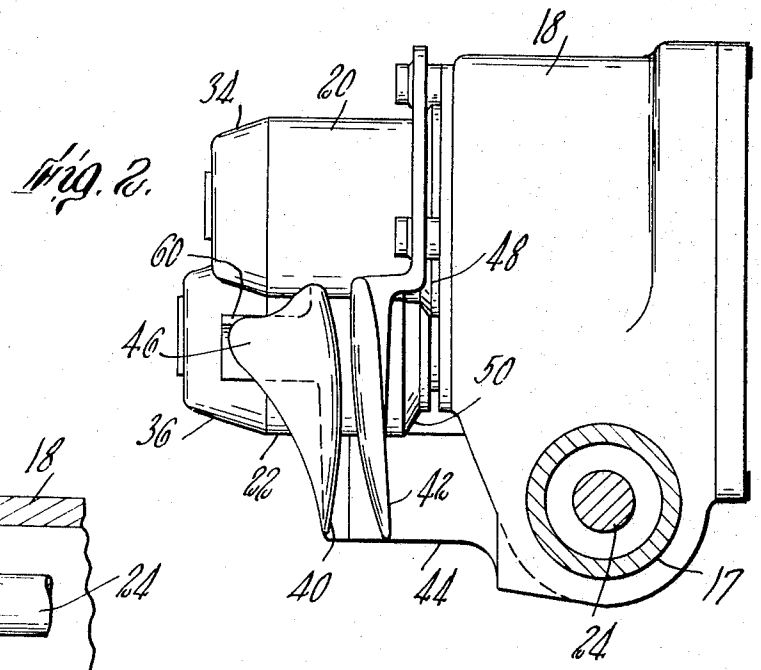

Fig. 2.

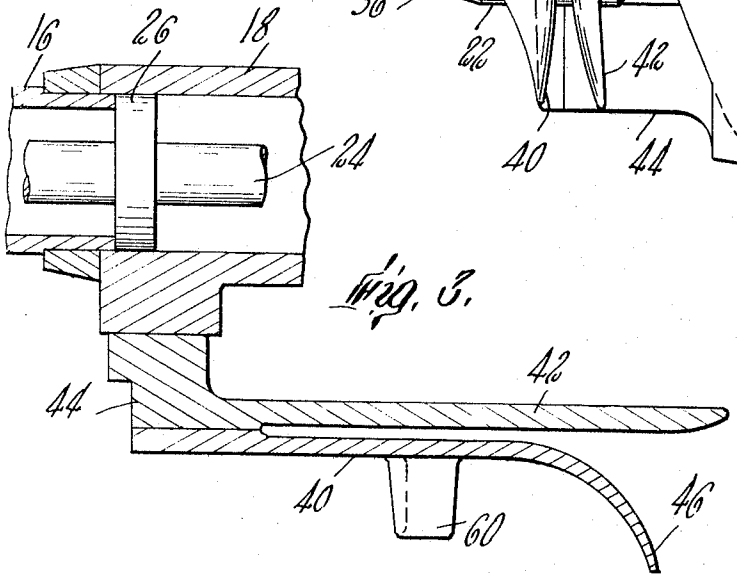

Fig. 3.

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Fig. 4.

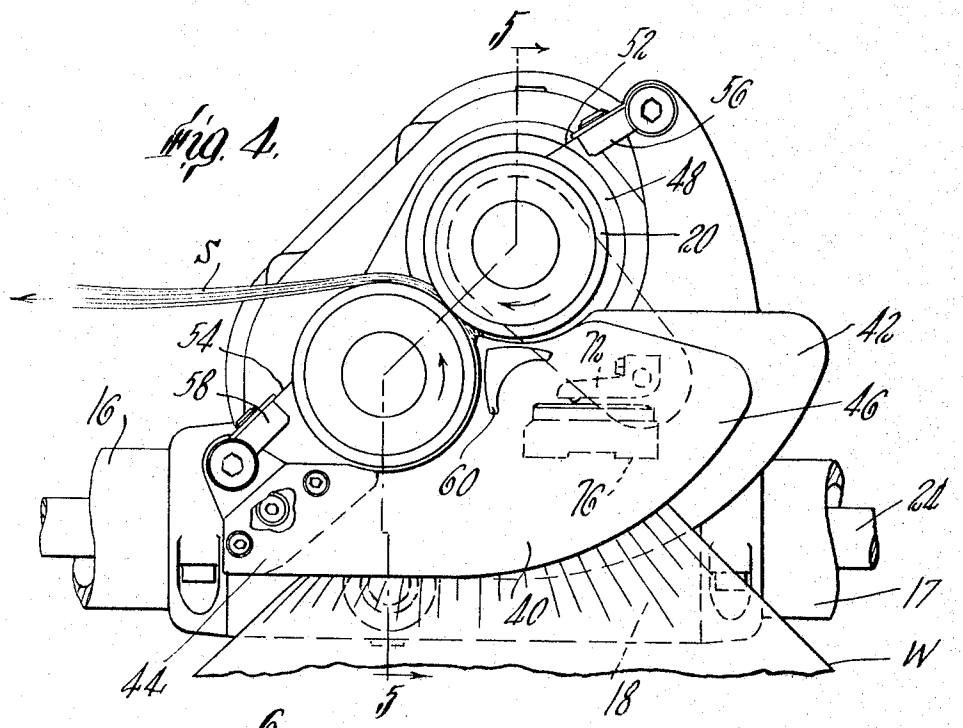
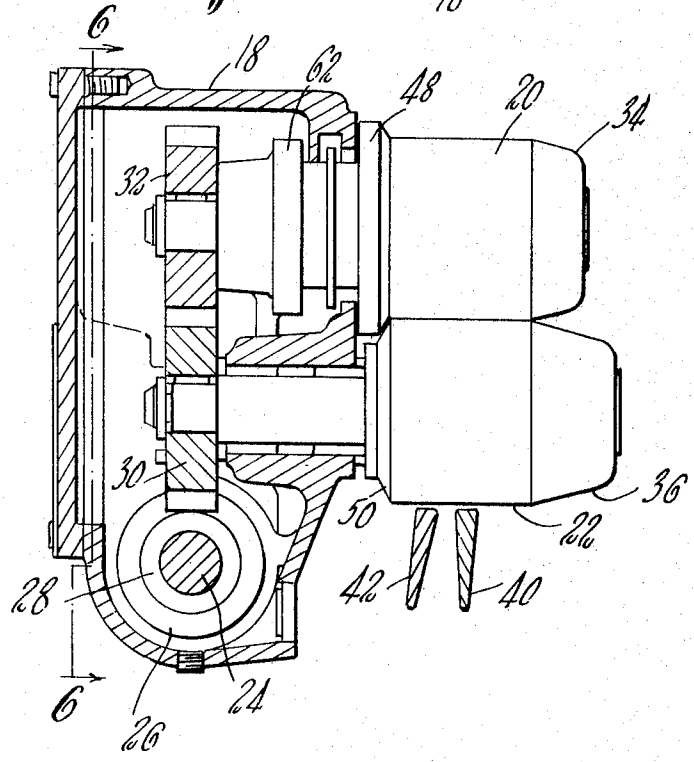


Fig. 5.



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WEB CONDENSER AND CALENDER

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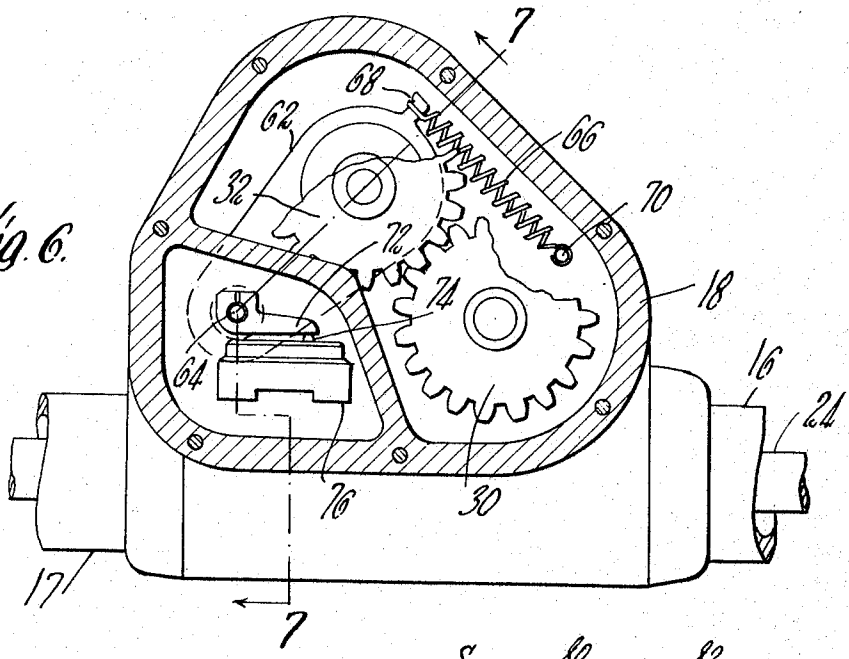

Fig. 6.

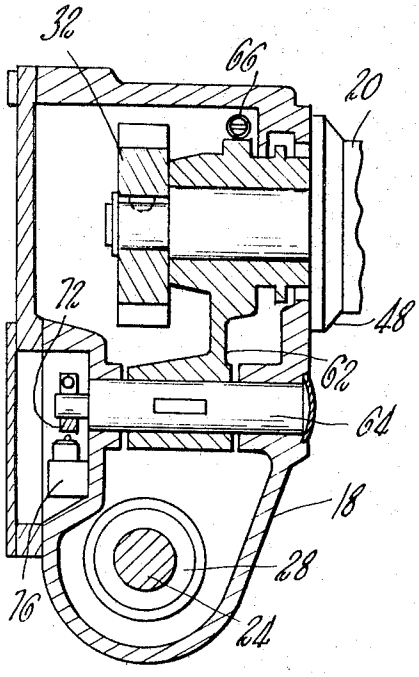

Fig. 7.

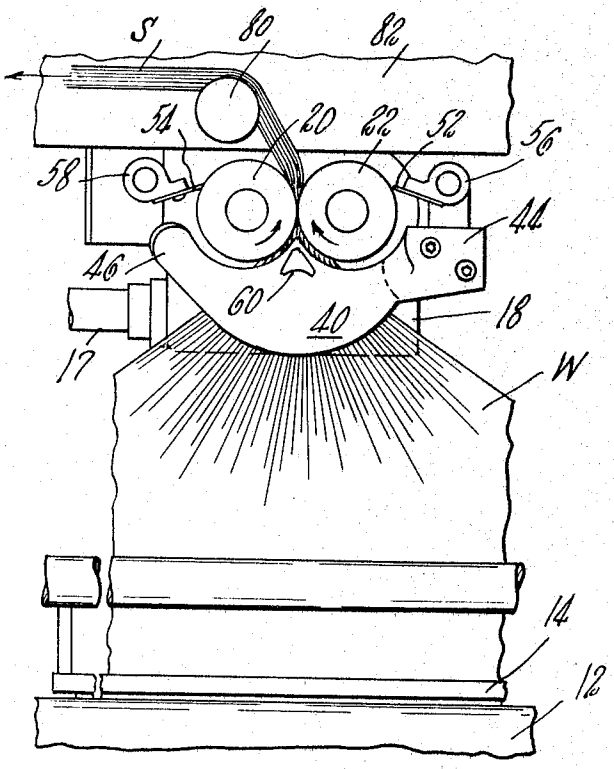

Fig. 8.

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WEB CONDENSER AND CALENDER

Virgil A. Burnham, Saco, Maine, and Richard W. Munroe, Gastonia, N.C., assignors, by mesne assignments, to Maremont Corporation, Chicago, Ill., a corporation of Illinois

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4 Claims. (Cl. 19—150)

This invention relates to a web condenser or sliver forming calender for a textile card. More particularly the invention relates to apparatus that will produce an improved sliver from the web as the web comes off from a card. Such sliver is handled singly or is used in building up a composite, multi-layered sliver from a parallel series of card slivers as in a multiple card system, which single or composite sliver is thereafter fed to a drafting element such as a draw box and further processed or coiled into a can or other package.

One object of the invention is to provide apparatus for forming a web of fibers into a kind of sliver more easily drafted in subsequent operations.

Another object is to provide sliver forming apparatus that greatly simplifies the task of piecing-up, that is, threading the web through the mechanism.

A further object is generally to improve and simplify web condensing or sliver forming apparatus and provide mechanism for producing a dependably superior and uniform sliver from a card web.

Still another object is to provide an arrangement in which, when a sliver is reduced or ceases to run between the calender or forming rolls, a stop motion is actuated to interrupt the drive of the rolls and/or other parts of the machine.

These objects are met by providing a pair of exposed open-ended or cantilever supported calender rolls mounted and driven for rotation about parallel axes that are generally perpendicular to the plane of the web coming off from the card or other web producing machine. Sliver forming means in the nature of closely spaced parallel web guiding plates are disposed in advance of the calender rolls and these plates define between them an elongated narrow passageway which is perpendicular to the axes of the calender rolls and terminates closely adjacent the nip of the rolls. These sliver forming or web guiding plates are preferably positioned with their facing inner surfaces generally parallel to the plane of the traveling web which passes through them. The web guide plates are also exposed and open at one side or cantilever mounted to facilitate piecing-up of the web through the sliver forming apparatus. A movable spring-pressed mounting of one of the rolls is used to provide a movable element for actuating a stop switch and insuring pressure on the sliver.

Other objects and further details of that which is believed to be novel and included in this invention will be clear from the following description and claims, taken with the accompanying drawings in which are illustrated two examples of web condenser apparatus embodying the present invention and incorporating the exposed open-end mounted calender rolls and the exposed open-sided sliver forming plates perpendicular thereto as above generally described.

In the drawings:

FIG. 1 is a fragmentary end elevational view of one type of a high speed card at the discharge or doffing end showing the relationship of one form of an exemplary web condenser according to the invention with respect to other parts of the machine;

FIG. 2 is an enlarged sectional view on the line 2—2 of FIG. 1 showing one side or end of this form of the sliver forming apparatus;

FIG. 3 is an enlarged sectional view on the line 3—3 of FIG. 1 showing portions of this sliver forming apparatus as if looking downwardly;

FIG. 4 is a front elevational view of this exemplary web condensing apparatus, actually an enlargement of a portion of FIG. 1;

FIG. 5 is a sectional view substantially on the line and in the direction of the arrows 5—5 of FIG. 4;

FIG. 6 is a sectional view through the web condensing mechanism substantially on the line and in the direction of the arrows 6—6 of FIG. 5;

FIG. 7 is another sectional view through a portion of the sliver forming apparatus substantially on the line and in the direction of the arrows 7—7 of FIG. 6, and

FIG. 8 is a fragmentary top plan view of another type of card at the discharge or doffing end, showing a modified form of web condenser according to the invention and its relationship with respect to other parts of the machine.

In carrying out the objects of this invention, in the first embodiment here shown, a high speed textile card of suitable construction is provided with a frame including side members 10 and 11 within and between which the usual card mechanism including a main cylinder with its flats (not shown) is suitably supported and driven. At one end of the machine a conventional doffer cylinder 12 is mounted between the sides of the frame for rotation about an axis extending transversely of the machine, with its clothing running, as usual, in cooperative engagement with separated fibers on the main cylinder. The doffer cylinder removes the cotton or other fibers from the main cylinder as a uniform fleece and a doffing comb 14, or similarly functioning element, ordinarily removes the fleece or web from the doffer cylinder clothing. The doffing comb in the apparatus here first shown removes the textile fibers from the doffer cylinder in a diaphanous web or sheet W, traveling in a vertical plane extending horizontally across the width of the machine. It is this web which is to be condensed and formed into a continuous card sliver according to the apparatus of this invention, and the position of the plane of the generated web with respect to the axes of the calender rolls is significant. In the type of card shown in FIG. 8, the web is removed from the cylinder 12 by the comb 14 and travels horizontally forward in a plane extending horizontally across the width of the machine.

The web condensing apparatus is located between the sides of the card, above the doffer cylinder in the form shown in FIGS. 1 through 7 being carried, for example, by support tubes 16 and 17 secured to and extending inwardly from the opposite sides of the machine frame. These support tubes lead to and carry, centrally of the card frame, a calender gear box or housing 18 within or on which the other elements of this invention are carried. See particularly FIG. 2 and FIGS. 4 through 7. In the apparatus of FIG. 8, the same reference numbers are used for comparable parts of the apparatus although their positions and shapes are somewhat different because in this machine the plane of the generated web is horizontal and the web condenser is in front of the doffer cylinder.

For compressing the fibers in the web to form a silver, the housing in the first form shown carries a pair of rotatably driven, outwardly projecting, cantilever supported cylindrical calender rolls, a top or right-hand roll 20 and a bottom or left-hand roll 22, which are suitably driven as from a drive shaft 24, rotatably mounted within the support tubes as on bearings 26 (FIGS. 3 and 5) and carrying a central drive pinion 28 rotating within the gear box as seen best in FIG. 5. Power for rotating the drive shaft may be obtained from the usual card driving gears or other mechanisms carried in the main machine frame and deriving motion from the main drive in a man-

ner readily understood. Meshing with the drive pinion is a helical gear **30** on the left-hand roll, and a cooperating helical gear **32** engages gear **30** to drive the right-hand roll. FIGS. 5 through 7 show gear arrangements. In the form of FIG. 8, the roll **20** and the roll **22** are mounted in a different position, with their axes extending vertically and upwardly, but they are supported and driven at their lower ends from the gear box **18**, their free ends projecting outwardly of the machine. Suitable drive shaft and gearing arrangements are made as in the other form to rotate the rolls.

The inter-engaging helical gears, and therefore the right and left calender rolls, rotate in opposite directions, that is, with the adjacent faces of the rolls traveling in the same direction, the axes of the calender rolls in the first form extending horizontally in the direction of the length of the card frame. In the second form shown, the axes of the rolls extend vertically, as above explained. In both cases the calender roll axes are perpendicular to the plane of the web W and project outwardly of the machine. This arrangement leaves the outer projecting ends of the right-hand and left-hand calender rolls exposed and free or open, and these exposed outer ends are preferably tapered and rounded as at **34** and **36** for purposes that will later become clear.

In the usual card, the sliver is formed by drawing the fleece or web through a tapered condenser or doffer trumpet by means of calender rolls disposed beyond the trumpet. According to this invention, a trumpet in the ordinary sense is not used but the sliver forming means in advance of the calender rolls consists of a pair of spaced, substantially parallel web guiding or sliver forming plates, a front or top plate **40** and a back or bottom blate **42**, these plates being suitably cantilever supported and secured together near one side end or edge at as **44** on the outside of the housing **18** as seen in FIGS. 2 3, and 4. This leaves the other side end or edge of the plates exposed and free or open, and this side edge, or at least the extreme exposed side end of the front or top plate **40**, is flared or curved outwardly, away from the other plate, as at **46** (see FIG. 3) to guide the web more easily during initial loading or a piecing-up operation. In both forms here shown, the sliver forming plates define an elongated narrow passageway between their closely spaced generally parallel inner surfaces. The web guiding and forming passageway extends in a plane normal or perpendicular to the axes of the calender rolls, this forming plane also being parallel to and practically coincident with the plane of the web generated from the doffer cylinder. The inner surfaces of the sliver forming plates extend close to the nip of the calender rolls within the cylindrical length of the rolls and away from their tapered and rounded ends. The roll **20** that is closest to the open side end of the forming plates in both forms shown is purposely made somewhat smaller in length or shorter than the other roll to help in positioning of the web during piecing-up.

In addition to the flared open side end **46** of the plates, the outer edges over which the web passes on the way to the rolls may be somewhat flared and all edges smoothly rounded for obvious reasons.

One of rolls may be provided at its inner end with a flange, such as the flange **48** on the roll **20**, and the other roll may have a cooperating inwardly stepped edge, such as the re-entrant annular recess **50** on roll **22** (FIG. 5). These are provided to resist the wrap-around of fibers on the shafts of the calender rolls as they are rotated. Further to prevent the build-up of undesired fibers on the rolls, hinged clearer blades **52** and **54** may be provided to bear with their edges against the right and left calender rolls respectively, being mounted suitably from the housing as by clearer blocks **56** and **58** respectively.

Some details of the exemplary apparatus are worthly of note. For example, the front or top web condenser plate **40** may carry a post **60** (FIGS. 2, 4 and 8) projecting from the outer face of the plate and alongside the peripheries of both calender rolls near their nip. This post is useful when piecing-up the web to prevent an operator from accidentally catching a finger between the rolls. It will be seen that when the width of the web has been gathered together into a fan shape it may be slipped easily between the plates **40** and **42** from their exposed flared open end **46**, and post **60** will help the operator then to place the gathered web safely into the exposed tapering space leading to the nip between the rolls. The shorter roll **20** (FIGS. 2, 4, 5 and 8) permits the operator to manipulate the gathered end of the web easily over its free end and into the nip.

In order to provide a stop signal for control purposes, one calender roll is not mounted on a fixed axis of rotation but is supported and driven on an axis movable with respect to the axis of the other roll. It may be rotatably carried by the free end of a swing arm **62** which is pivoted in the housing as by a stud **64** journaled in the housing as seen best in FIGS. 6 and 7. A tension spring **66**, extending between a lug **68** on the swing arm and a fixed grooved pin **70** in the housing, constantly urges the calender rolls together and their helical gears into engagement with one another. Other arrangements for the movable roll may be used and other weighting or loading of the rolls may be provided if desired.

As a stop signal means, which may be utilized to shut off the driving power to the calender rolls or to the card as a whole when the sliver is "lost" or runs out, one end of the pivot stud **64**, which is keyed or otherwise secured to the swing arm, carries a switch arm **72**, the free end of which is positioned to engage against the plunger actuator **74** of a commercially available normally closed-contact switch **76**. The switch may control a circuit to a motor or drive for the shaft **24**, for example, or to the entire card or a multiple assembly thereof. As will be understood most easily by reference to FIG. 6, when the rolls are moved too close together, as when all or a portion of a sliver ceases to run between the rolls, arm **72** depresses actuator **74** to open the contacts of switch **76**. When the swing arm **62** is lifted, as by restoration of the sliver between the rolls, the free end of the switch arm **72** will also be lifted because of rotation of the pivot stud **64**, and the actuator **74** will no longer be depressed by the switch arm. Therefore, the contacts of the switch **76** will be free to assume their normal position, which is the closed circuit position, and the electrical circuit to the motor or drive for the calender rolls or other drive will be restored. Suitable manual adjustment may be provided for changing actuation of the switch to conform to any desired degree of approach of the rolls, one to the other.

In the first form, the condensed web or sliver S may be directed toward one side of the machine as shown, for further handling or storage. In the form of FIG. 8, the sliver leaving the calender rolls may first be passed around a sliver guiding stud **80** and then travel over a horizontal table **82** for further calendering or other processing. Other guides, supports and drives for the sliver are provided as needed, depending upon the location and position of the web condenser on the card and the operations to follow the forming of the sliver.

The sliver forming apparatus of this invention is particularly convenient as it can be used for end-around piecing of sliver from the card web. This can be accomplished easily and quickly because the open plate and roll ends are entirely clear. No "threading" in the normal sense is required and an operator can slide the fan-gathered web between and into the sliver forming plates between their exposed, flared open ends and then into the nip between the calender rolls by introducing the gathered web between the rolls at their exposed tapered and rounded open ends. Thereafter, the cylindrical parts of the rolls drive the web and the sliver forming plates

hold the traveling web and sliver in the nip of the calender rolls within their length with no tendency to jump out.

The web guiding plates being generally parallel to each other and most of the space between them parallel to and practically coincident with the plane of the converging web, the faces of the web are not substantially confined or compressed until they reach the calendering rolls. Even then, the compression is edgewise of the web to hold it in a fan shape, because the rolls are working on axes perpendicular to the plane of the generated web. The cantilever or one-sided support of the web guiding plates also leaves the selvedges of the web practically free and unconfined until they reach the nip of the rolls. This results in far less disarrangement of the fibers in the web, and fibers are not turned back from the selvedges into the web as they might be if a conventional "trumpet" were used. Because of this, a sliver formed with equipment according to this invention has no hard core and therefore will more easily be drafted in a subsequent operation such as breaker drawing.

As will be evident from the foregoing description, certain aspects of this invention are not limited to the particular details set forth as examples, and it is contemplated that various and other modifications and applications of the invention will occur to those skilled in the art. It is therefore intended that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of the invention.

What is claimed is:

1. In a carding machine having a doffer cylinder with means generating a web of fibers across a plane extending transversely of the machine,

apparatus for forming said web of fibers into a sliver comprising

a pair of cantilever supported calender rolls mounted for rotation about parallel axes generally perpendicular to the plane of said web and projecting outwardly of the machine, said rolls having their projecting unsupported ends open to receive the web in transversely gathered condition,

a pivoted arm carrying one of said rolls for movement toward and away from the other while maintaining the axes of said rolls parallel,

spring means biasing said arm to urge said one roll toward engagement with the other to form a nip between said calender rolls,

drive means to rotate at least one of said calender rolls to advance the web through the nip between the rolls,

a pair of closely spaced sliver forming plates with facing web guiding surfaces thereon, cantilever-supported at one end in front of said calender rolls and unsupported and open at the opposite end, the said facing web guiding surfaces of said spaced plates defining between them an open-ended web receiving passageway elongated transversely of the machine, said facing web guiding surfaces on said plates extending generally parallel to one another in closely spaced planes perpendicular to the axes of said calender rolls and parallel to the transverse generating plane of said web on either side of the web,

said facing web guiding surfaces having portions terminating close to the nip between said calender rolls, away from the ends of said rolls, and

the unsupported open end of said plates opposite said supported end being outwardly flared to receive a web.

2. In equipment having means generating a web of fibers across a plane extending transversely thereof,

apparatus for forming said web of fibers into a sliver comprising

a pair of cantilever supported calender rolls with exposed free ends mounted for rotation about parallel axes generally perpendicular to the transverse plane of said generated web of fibers, said rolls having their exposed free ends open to receive said web in transversely gathered condition from said means generating said web,

means biasing one of said rolls toward engagement with the other roll in said pair to form a nip between said rolls,

drive means to rotate at least one roll of said calender roll pair to advance the web through the nip between the rolls, and

sliver forming means disposed immediately in advance of said calender rolls,

said sliver forming means comprising a pair of spaced cantilever supported web guiding plates with facing surfaces thereon defining an open-ended narrow passageway therebetween, elongated transversely of the web and having an unsupported and open side end opposite the cantilever supported mounting of said plates, said facing surfaces being closely spaced and extending generally parallel to one another in planes generally perpendicular to the axes of said calender rolls and generally parallel to the transverse plane of said generated web on opposite faces of the web,

a portion of said facing web guiding plate surfaces terminating closely adjacent the nip between said calender rolls within the length of said rolls and away from said exposed free ends thereof.

3. Sliver forming apparatus according to claim 2 in which

said spaced web guiding plate facing surfaces are flared at said open side end of said transversely elongated passageway for easy introduction of the web between said facing surfaces and between the said exposed free ends of said rolls.

4. Sliver forming apparatus according to claim 2 in which

said exposed free ends of said calender rolls are tapered for easy introduction of the web into the nip between said rolls.

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MERVIN STEIN, *Primary Examiner.*

DONALD W. PARKER, *Examiner.*

D. NEWTON, *Assistant Examiner.*