Dec. 22, 1964 W. J. HOGG ETAL 3,162,004

AUTOMATIC SCAVENGER FOR PAPER YARN MACHINE

Filed May 17, 1963 3 Sheets-Sheet 1

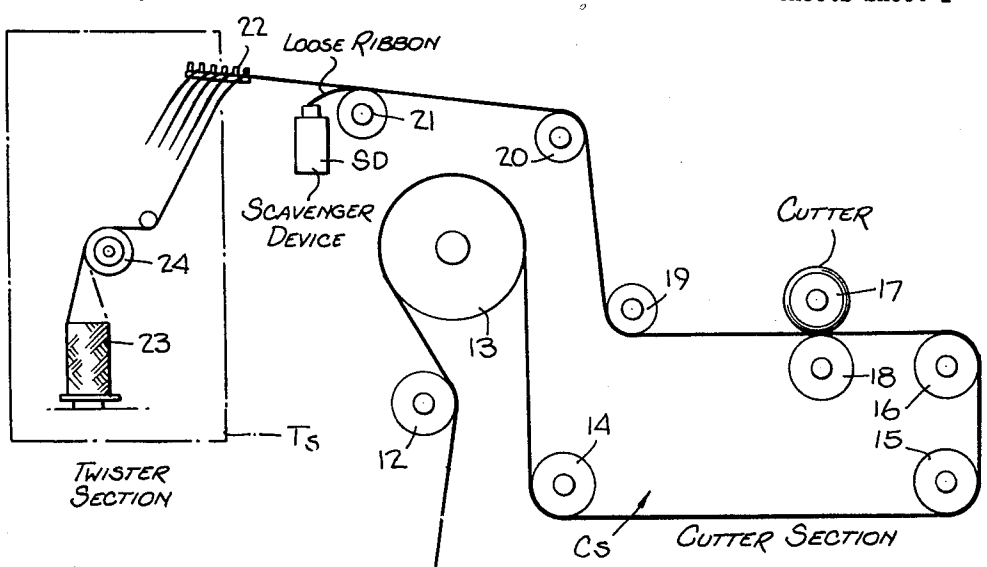


Fig. 1.

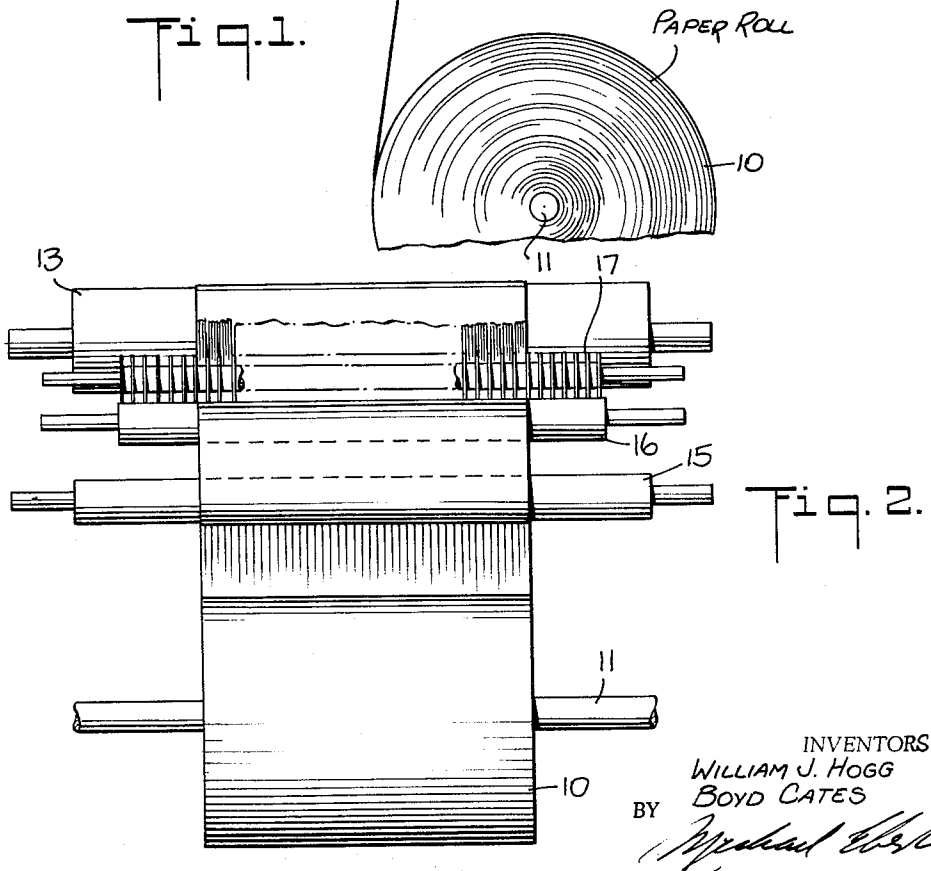


Fig. 2.

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AUTOMATIC SCAVENGER FOR PAPER YARN MACHINE

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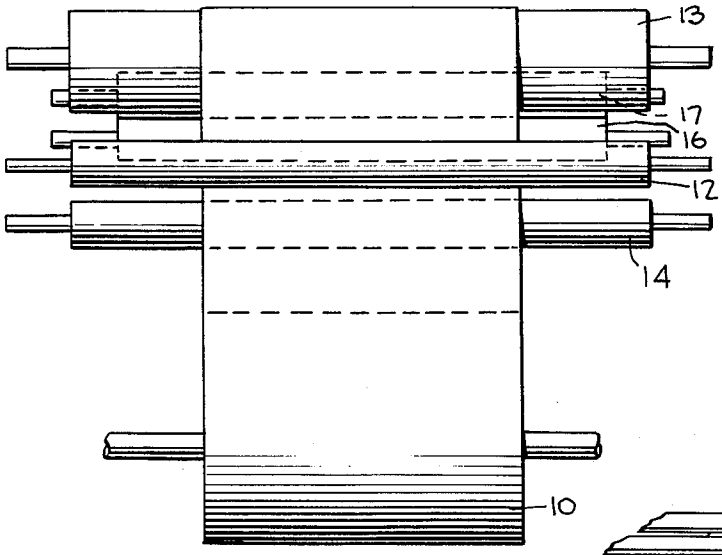
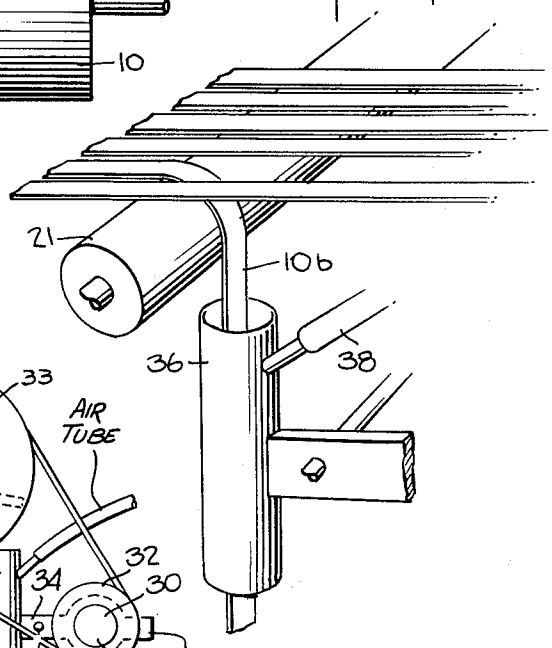


Fig. 3.

Fig. 7.



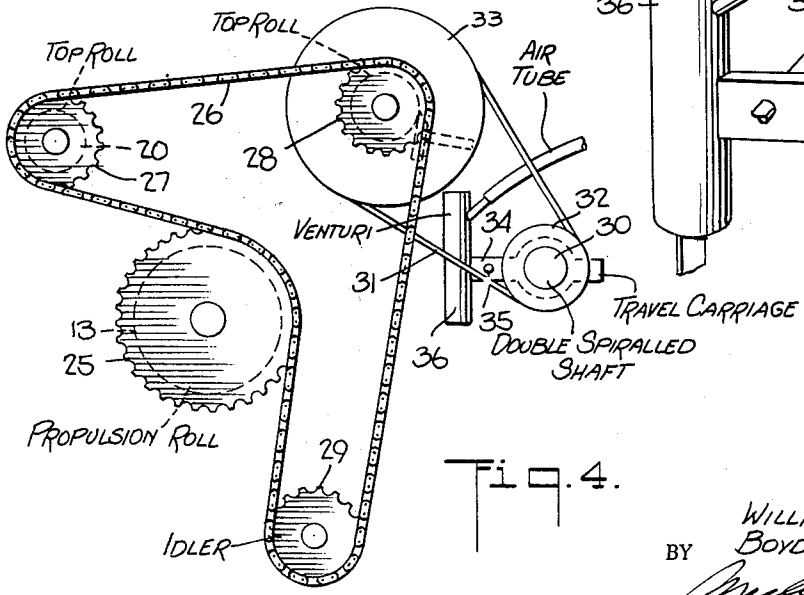


Fig. 4.

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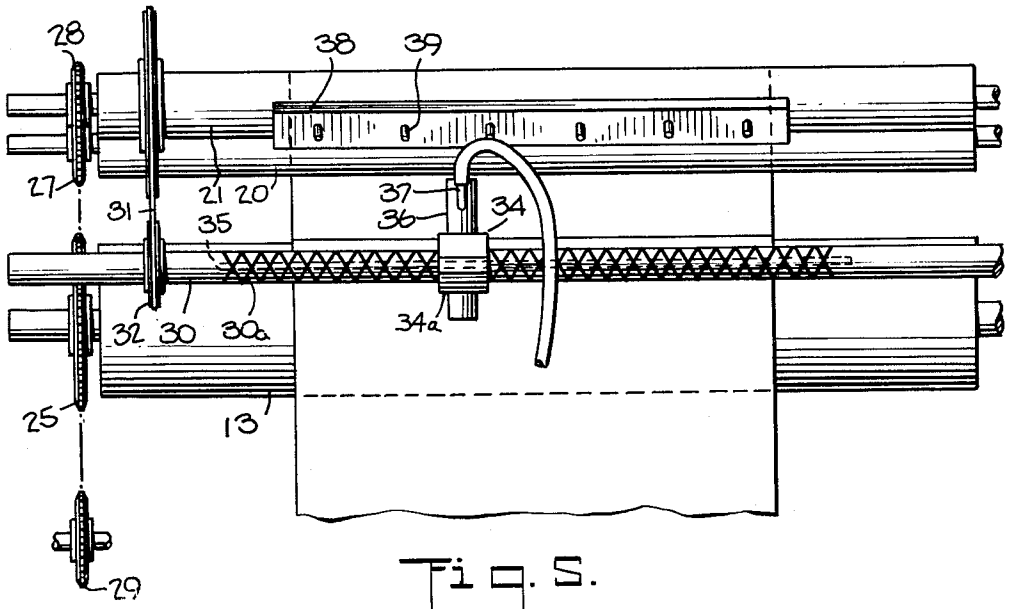


Fig. 5.

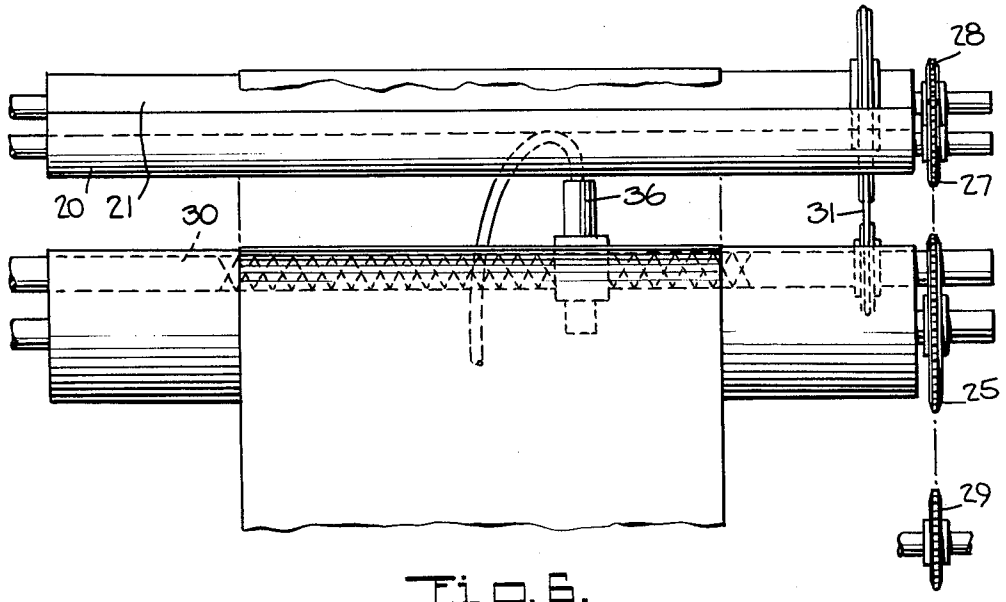


Fig. 6.

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3,162,004

AUTOMATIC SCAVENGER FOR PAPER YARN MACHINE

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10 Claims. (Cl. 57—31)

This invention relates generally to machines for manufacturing paper yarn by slitting a paper web into ribbons which are then individually twisted to form yarn, and more particularly to an automatic scavenger for picking up the loose ends of ribbons resulting from breakage thereof in the cutting unit of the machine.

In manufacturing paper yarn, the conventional practice is to convey a broad web of paper into a cutting mechanism which slits the web into individual ribbons, the ribbons then being led by a spreader into a multiple spindle twister section where each ribbon is twisted into yarn.

In one known high speed machine for making paper yarn, the sole propulsive force for moving the paper through the processing cycle is provided by the spindles on which the twisted yarns are wound. The spindles exert a pulling force on the ribbons which acts to draw the paper web from the roll through the cutting section. Since the tensile strength of paper is not great, there is a tendency for the ribbons to break. Heretofore, when a break occurred, it was necessary to shut down the machine to repair the break, with a resultant loss in production time.

One major improvement in the manufacture of paper yarn is disclosed in the copending application of Sain and Hogg, Serial No. 216,601, filed August 13, 1962, now Patent No. 3,111,000 which issued November 19, 1963, wherein the machine is constituted by a cutter section having a propulsion roll for pulling a paper web from a roll thereof, the web being split into ribbons which are then directed into a twister section, and wherein the surface speed of the propulsion roll is synchronized with the feed rolls in the twister section to prevent tensioning of the ribbons which might result in their rupture. In this arrangement, the ribbons are pre-wet after being slit and they are again moistened before entering the twisters. Such pre-wetting acts to condition the paper fibers so as to improve their toughness and further reduce breakage.

Despite the improvement resulting from the arrangement disclosed in said copending application, ribbon breakage is still encountered. The loose ribbon ends have a tendency to whip about and to become entangled with the other ribbons, causing further breaks and further complicating repair. It becomes necessary therefore, when a break occurs, to shut down the machine as quickly as possible and to make the necessary splices in the ribbons. Such breaks are costly and time-consuming, for the machine remains unproductive while the breaks are being repaired.

Accordingly, it is the principal object of the invention to provide a scavenger which acts to pick up the loose ends of a broken ribbon in a paper yarn machine and to thereby prevent its entanglement with the other ribbons.

More specifically, it is an object of the invention to provide an automatic scavenger which repeatedly scans an area below a driven roll in the cutter section over which the ribbons are conveyed into the twister section of the machine, the scavenger acting to pick up a loose end of a ribbon falling below the roll and to maintain the loose end clear of the mechanism and of the other ribbons.

A significant feature of the invention is that the scavenger makes it possible to correct the break in the ribbon without shutting down the machine, thereby avoiding losses in production time.

Also an object of the invention is to provide a scavenger

of the above-mentioned type which is of simple and efficient design and which is reliable in operation.

For a better understanding of the invention, as well as other objects and further features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawing, wherein like elements in the various views are identified by like reference numerals. In the drawing,

FIG. 1 is a side view, partially schematic, showing the cutter section and a twister section in a yarn making machine including a scavenger device in accordance with the invention;

FIG. 2 is a front view of the cutter section shown in FIG. 1;

FIG. 3 is a back view of the cutter section shown in FIG. 1;

FIG. 4 is a side view of the scavenger device and top roll drive in the cutter unit;

FIG. 5 is a front view of the device shown in FIG. 4;

FIG. 6 is a back view of the device shown in FIG. 4; and

FIG. 7 schematically shows how the scavenger functions to prevent entanglement of a loose ribbon.

Referring now to the drawings, and more particularly to FIGS. 1, 2 and 3, there is shown in simplified form a yarn manufacturing machine made up of two main sections, namely a cutter section, generally designated by letters CS, and a twister section TS.

Cutter section CS includes a roll of paper 10 supported on a shaft 11 and held in position thereon by suitable arbors. The broad web of dry paper 10, drawn from the roll thereof, is guided upwardly by a first idler roll 12 over a propulsion roll 13, and down to a second idler roll 14, from which point it is conveyed horizontally toward a third idler roll 15, and from there upwardly to a fourth idler roll 16. From idler roll 16 the web 10 passes into a cutter assembly formed by a driven roll 17 having annular blades thereon which engage a platen roll 18 to slit the web into a multiplicity of narrow ribbons 10*a*, 10*b*, 10*c*, etc.

The ribbons are guided under a fifth idler roll 19 and upwardly to a higher level where they pass over driven top rolls 20 and 21 positioned above the propulsion roll 13. From the top rolls the ribbons enter a suitable separator 22 having raking fins which spread the ribbons apart before entering the twister section TS.

The twister section may be of the type disclosed in the above-noted copending application, or of any known form, and it includes a bank of spindle spools 23 above which are rotatably supported feed rolls 24. Each ribbon at the feed roll is twisted and wound about the associated spool which is placed over and driven by the twister spindle. The various spindles are concurrently driven, but conventional clutch or equivalent means (not shown) are provided to disengage any spindle from the drive mechanism therefor and thereby to halt the rotation of the spool thereon in the event of a ribbon break.

The problem to which the present invention is addressed, is that arising from rupture of any one of the ribbons 10*a*, etc. Such breaks occur generally in the twister section where the ribbon is subjected to tensioning stresses. Hence when a break occurs, the associated spool winds up one end of the ribbon, the other end lying loose over the top roll 21 in the cutter section.

To prevent the loose end, which is still being fed from the cutter section, from whipping about and becoming entangled with adjacent unbroken ribbons or becoming enmeshed in the rolls, there is provided a scavenger device, generally designated by letters SD, which acts to pick up the loose end and to keep it clear of the other ribbons until the operator is able to repair the break.

The structure of the scavenger SD is shown in FIGS. 4,

5 and 6, where it will be seen that propulsion roll 13, which serves to draw the web from the paper roll, is provided at one end with a sprocket wheel 25 adapted to drive the top rolls 20 and 21 through a suitable sprocket chain 26. Top roll 20 is provided with a sprocket wheel 27 and top roll 21 with a sprocket wheel 28, the chain 26 engaging these wheels as well as an idler sprocket wheel 29 which permits a greater contact length of the chain on sprocket wheel 25.

Rotatably mounted below top roll 21 and to one side thereof in parallel relation therewith, is a shaft 30 having a double spiralled track 30*a*. Shaft 30 is driven at a relatively high speed by a belt 31, the belt encircling a pulley 32 on shaft 30 and a pulley 33 on top roll 21. The belt permits slippage in the event jamming of the spiral mechanism occurs.

The track of the double spiralled shaft 30 is operatively engaged by the follower arm 34*a* of a traveller carriage 34 which, as the shaft rotates is caused to traverse the shaft with a back-and-forth motion and in effect, acts to scan the area below the drive roll 21. A guide bar 35 fixedly supported adjacent the double spiralled shaft 30 passes through a bore on the follower arm 34*a* and thereby prevents turning of the reciprocating traveller carriage 34.

Vertically mounted on the carriage 34 is a Venturi tube 36 provided with a Venturi nozzle 37 to which a flexible air tube is connected. The flexible tube is connected to an air pump (not shown) such that when air is blown through the Venturi nozzle 37, a vacuum is induced in the Venturi tube 36. The resultant suction causes a loose ribbon end falling below top roll 21 to be drawn into the Venturi tube.

Since the traveller carriage scans reciprocably across the top roll, any loose ribbon end along the row of ribbons passing over the roll is picked up by the Venturi tube and held therein as the broken ribbon continues to feed therethrough. A scraping bar 38 having separating or stabilizing pins 39 is mounted against the top roll 21 and acts to prevent the loose ribbon from winding about the roll. All of the rolls described above are supported in suitable bearings mounted on the frame of the machine.

Thus when a ribbon break occurs during machine operation, the scanning scavenger picks up the loose end in the cutter section, the other end being wound up on the associated spindle spool. It is not necessary to shut down the machine to repair the break, for all that need be done is to halt the associated spindle, all other spindles remaining active. The operator merely pulls the loose end from the scavenger and splices it onto the associated spindle, which is then returned to normal operation.

It will be appreciated that the scavenger disclosed herein may be used with any existing type of paper yarn manufacturing apparatus in which a web is slit into ribbons, and in which the ribbons are then twisted. To facilitate the repair of breaks, one may provide optical, mechanical or electrical sensors with each of the ribbons feeding into the twister section, so that the moment a break occurs, a suitable light or sound indication thereof is provided, giving its location. It is also possible in conjunction with such indications by means of an electromagnetic device operated by the activated sensor to automatically shut off the associated spindle, whereby the operator need only form a quick splice and then return the spindle to operation.

While there has been shown a preferred embodiment of automatic scavenger for paper yarn machines, in accordance with the invention, it will be appreciated that many changes and modifications may be made therein without, however, departing from the essential spirit of the invention as defined in the annexed claims.

What is claimed is:

1. In a machine for manufacturing paper yarn wherein a paper web is conveyed through a cutting mechanism and is slit into a row of ribbons which are then individually twisted, said machine including a roll conveying said row of ribbons, a scavenger device for picking up broken ends of said ribbons to facilitate repair thereof, said device comprising a reciprocating carriage repeatedly scanning an area adjacent said roll below said row of ribbons, and a suction device supported on said carriage to pick up a loose ribbon end from any ribbon in said row.

2. In a machine for manufacturing paper yarn provided with a cutting section wherein a paper web is conveyed through a cutting mechanism to slit same into a row of ribbons and a twister section wherein said row of ribbons are individually twisted and wound about spindle spools, said machine including a roll conveying said row of ribbons, a scavenger device for picking up broken ends of said ribbons to facilitate repair thereof, said device comprising a reciprocating carriage repeatedly scanning an area adjacent said roll below said row of ribbons, and a suction device supported on said carriage to pick up a loose ribbon end from any ribbon in said row.

3. In a machine for manufacturing paper yarn provided with a cutting section wherein a paper web is conveyed through a cutting mechanism to slit same into a row of ribbons and a twister section wherein said ribbons are individually twisted and wound about spindle spools, said machine including a roll conveying said row of ribbons, a scavenger device for picking up broken ends of said ribbons to facilitate repair thereof, said device comprising a carriage, a rotating shaft operatively coupled to said roll and having a double spiral track, a follower arm extending from said carriage to engage said track whereby said carriage moves back and forth and repeatedly scans an area adjacent said roll under said row of ribbons, and a suction device supported on said carriage to pick up a loose ribbon end from any ribbon in said row.

4. In a machine as set forth in claim 3, wherein said suction device is constituted by an open tube having a venturi nozzle attached thereto coupled to an air tube to induce a vacuum in the tube.

5. Apparatus for manufacturing paper yarn comprising a cutter section including means to support a paper roll, a cutter mechanism, a propulsion roll, a driven guide roll supported above said propulsion roll, a spreader, a means to convey a web from said paper roll through said propulsion roll and said cutter mechanism to form a plurality of ribbons which are guided across said guide roll into said spreader to separate said ribbons; a twister section including a like plurality of spindles and feed rolls to convey the spread ribbons from said cutter section into said spindles; and a scavenger including a suction tube, and means to effect reciprocable scanning of said tube in an area below said guide roll under said plurality of ribbons to pick up the broken end of a ribbon from said plurality thereof.

6. Apparatus as set forth in claim 5, wherein the operation of said propulsion roll and said feed rolls are synchronized and wherein said driven guide roll is operated from said propulsion roll.

7. Apparatus as set forth in claim 6, wherein said means to effect reciprocable scanning is constituted by a double spiral track operatively coupled to said driven guide roll.

8. Apparatus for manufacturing paper yarn comprising a cutter section including means to support a paper roll, a cutter mechanism, a propulsion roll, a driven guide roll supported above said propulsion roll, a spreader, a means to convey a web from said paper roll through said propulsion roll and said cutter mechanism to form a plurality of ribbons which are guided across said guide roll into said spreader to separate said ribbons; a twister section including a like plurality of spindles and feed rolls to convey said spread ribbons from said cutter section into said spindles; and a scavenger including a suction tube, and a double spiral shaft operatively coupled to said driven roll to effect reciprocable scanning of said tube in an area below said guide roll under said plurality of ribbons to pick up the broken end of a ribbon from said plurality thereof.

9. Apparatus as set forth in claim 8 further including a scraping blade engaging said driven guide roll to prevent a broken ribbon from winding thereabout.

10. Apparatus for manufacturing paper yarn comprising a cutter section including means to support a paper roll, a cutter mechanism, a propulsion roll, a driven guide roll supported above said propulsion roll, a spreader, a means to convey a web from said paper roll through said propulsion roll and said cutter mechanism to form a plurality of ribbons which are guided across said guide roll into said spreader to separate said ribbons; a twister section including a like plurality of spindles and feed rolls to convey said spread ribbons from said cutter section into said spindles; and a scavenger including a carriage, a suction tube mounted on the carriage, and means coupled to said driven roll to effect reciprocable scanning of said carriage in an area below said guide roll under said plurality of ribbons to cause said tube to pick up the broken end of a ribbon from said plurality thereof.

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