March 24, 1959 H. M. BACON 2,878,637

FLYER-HEAD ROVING PRE-TWISTER CONDENSER

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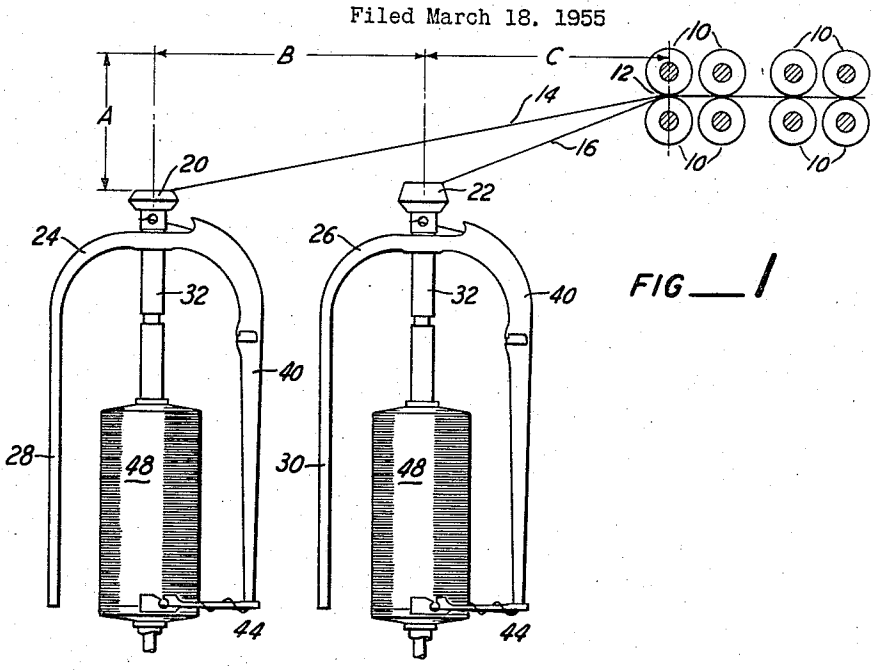


FIG. 1

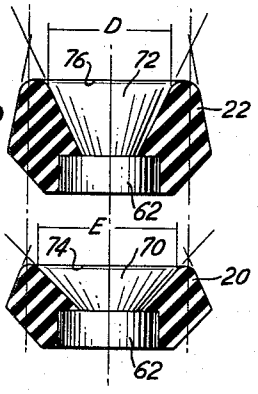


FIG. 2

FIG. 3

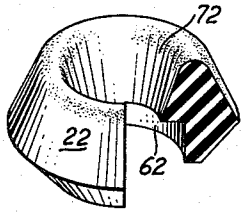


FIG. 4

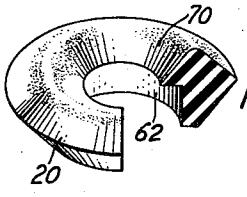


FIG. 5

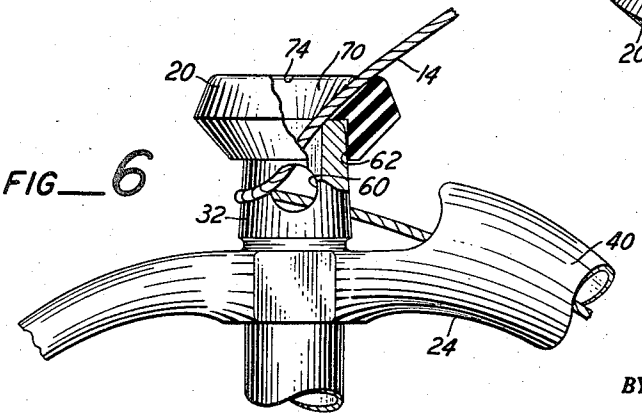


FIG. 6

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FLYER-HEAD ROVING PRE-TWISTER CONDENSER

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4 Claims. (Cl. 57—115)

My invention relates to roving assemblies and, more particularly, to a flyer-head roving pre-twister condenser. Briefly, the condenser includes an annular body through which the roving passes in entering the flyer throat and which produces a "false" or "mock" twist in the free zone of the roving between the nip of the delivery drawing rollers and the flyer head.

Wool and like fibers in a yarn mill are usually passed through a roving frame reducing the fibrous rovings and delivering them to a flyer which lays them on bobbins for further processing. In the drawing rollers of the rover, static electricity is generated in the textile fibers. If the fibers are not bound together by twist, moisture or oil, they repel each other in the free zone when released from the pressure of the drawing rollers. The roving may expand or "billow" between the delivery rolls and the flyer. This is a prime cause for loss of weight in the form of lint. The problem of static electricity is increased when artificial or synthetic fibers are mixed with natural textile fibers. To reduce this type of loss the mills commonly operate their machinery at such speeds as may not be fully economical.

The use of short staple fibers is common in all textile yarn, especially in blends with longer fibers. The short fibers are prone to drop out unless bound in. The only effective binding is twist.

Therefore, it has been found beneficial to insert a "false" twist in the roving between the delivery rollers and flyer head. The rotation of the flyer imparts some twist to the roving. The amount of such twist is determined, not by the need of the roving coming into the flyer, but rather on what is suitable for the following spinning operation. This twist, proper for spinning, is far too low for the incoming roving to have suitable twist to safely pass the free zone.

Some work has been done in devices to increase the false twist in the free zone. However, in those condensers observed, the twist of the roving is not controlled and does not appreciably condense the roving through twist and the condensers did not permit significant increases in drafting speeds. Further, no condenser observed gave equal twist to front and back flyers, where rovings are handled through different length free zones. My condenser appears to be the first that will twist the roving perfectly between the flyer head and the delivery nip and thus catch and hold lint fibers at the point of delivery.

The objects of my invention include, therefore: to devise an improved condenser for a flyer head; to provide condensers particularly adapted to rovings which are a blend of natural and artificial fibers and of long and short fibers and those involving trouble with static electricity; to devise a condenser having a continuous and controlled action condensing the roving in the free zone back to the delivery rolls; to provide an improved false twist in the free zone condensing the roving so as to form firmer, heavier bobbins with a minimum twist on the bobbins; to provide condenser heads particularly adapted for front and back flyers; and to improve the economic operation of roving frames, including saving fiber and yarns and permitting greater drafting speeds.

My invention will be best understood, together with additional objectives and advantages thereof, from the following description, when read with reference to the drawings, in which:

Figure 1 is a fragmentary elevational view showing essential parts of a roving assembly with specific embodiments of my condenser in place;

Figures 2 and 3 are full scale vertical sectional views of two condensers taken on planes passing through the vertical axes of the condensers;

Figures 4 and 5 are enlarged perspective views of the condensers with parts broken away and shown in section; and

Figure 6 is an enlarged, fragmentary elevational view of the front flyer head with portions of the assembly cut away and shown in section.

In the simplified showing of Figure 1 a series of drafting rollers **10** are indicated through which front and back rovings **14, 16** are delivered. The rovings emerge from the nip **12** of the delivery rolls into the free zone between the drafting rolls and the flyers. As indicated above, trouble is caused in the free zone due to various factors. The application of an appropriate false twist to the yarn in the free zone will result in less loss of fiber, the delivery of a better roving to the flyer resulting in heavier, more compact bobbins, less yarn breakage, and operation of the drafting assembly at higher speeds. With the use of the front and back condensers **20, 22** as shown in the drawings, a better false twist has been achieved than has been heretofore possible. A textile mill using my condensers reports an increase of 20% in the productivity of their Whitin superdraft rovers. This company reported a marked decrease in rub board waste, a substantial decrease in fly waste and, also, that the better false twist resulted in a decrease of the actual twist on the bobbins so as to obtain a cleaner spin both on Whitin long-draft spinning frames, and on Bradford spinning frames.

Front and back flyer assemblies **24, 26** are of typical construction. The simplified showing includes inverted U-shaped flyers **28, 30** depending from hollow flyer heads **32**. The hollow arms **40** of the flyers have pivotally supported fingers **44** guiding the yarn in helical wraps or layers on bobbins **48**. It will be understood that conventional means are provided for rotating the flyers and bobbins, for elevating the bobbins and for supporting the assembly.

Referring to Figure 6, roving **14** leads into hollow head **32** and out through opening **60** into hollow arm **40**. The bottom of condensers **20, 22** have counterbores **62** which fit the upper ends of hollow flyer heads **32**. It is preferred that the condensers be made of resilient material, in which case the condensers may be secured in place by a friction or tension fit between condenser and flyer head. If desired, a layer of adhesive may be interposed to bond the parts together.

Condensers **20, 22** have inverted frusto-conical upper openings, the walls **70, 72** of which approximate but do not exceed the angle with the vertical at which rovings **14, 16** enter the flyer heads. To group the parts for illustration purposes, Figure 1 is slightly out of proportion as to the disposition of rovings **14, 16**. In an actual installation in which the condensers are of the sizes shown in full scale in Figures 2 and 3, dimension A in Figure 1 was 6¼", dimension B, 5½" and dimension C, 4¾", resulting in a 12" free zone in roving **14** and a 7¾" free zone in roving **16**. In these installations, a very slight bend at the top perimeter **74, 76** of conical

walls **70, 72**, results in proper contact between the condensers and the rovings.

Condenser **20** is shorter than condenser **22**, which means that the perimeter circumferences **74, 76** of walls **70, 72** are different. As the condensers rotate with the flyer heads, this means that the longer free zone of roving **14** will be subject to a greater total twisting action at **74** than will be found in the shorter roving **16** with the lesser diameter **76**. Diameter E is 1.13" with the 12" free zone of roving **14** and diameter D is 0.9" with the 7¾" free zone of roving **16**.

It will thus be seen that a different condenser is used for front flyer **24** than for the back flyer **26**. With the proportions shown and described, the false twist is approximately the same in rovings **14, 16**, leading to the same benefits in condensing the yarn in the free zone and in obtaining compact bobbins. As the flyers wind the yarn on the bobbins, the yarn is straightened from the false twist achieved by condensers **20, 22** to a very slight twist which is comparable to that which occurs without the condensers, but the yarn is denser. This denser yarn on the bobbin means a more efficient spinning operation.

To illustrate the need for different condensers, if condenser **20** is put on the back flyer and condenser **22** on the front flyer, the condenser on the front flyer more than sufficiently twists the roving **14** so that excessive kinking is observed and the condenser on the rear flyer achieves less than sufficient twist so as to billow the roving **16** back to the delivery rolls and cause fiber loss and roving breakage. The dimensions above may have to be varied when installations are made in other machines wherein different relationships may exist between the flyer and delivery rolls.

Best results will be obtained when condensers **20, 22** are formed of resilient material. The rovings may be wet or oily and the material of the condensers must be resistant to these agents. Natural or synthetic rubber of 50–70 durometer A hardness has been found suitable for this material. In a practical embodiment currently used of chloroprene polymer, the rubber hardness test showed 52–54 durometer A. Other moldable, resilient, oil resistant materials having appropriate coefficients of friction are polyethylene, Buna N, Buna S and natural and reclaimed rubber.

As indicated above, this inexpensive condenser results in very substantial saving, both in reduction of lint and in permitting faster operation of the rover. Ordinarily, in a well-known rover machine, the flyer-heads rotate at approximately 680 r.p.m. and the delivery rolls of two-inch diameter rotate at about 118 r.p.m. Through the use of my condensers the speed of the delivery rolls may be increased to 140 r.p.m. which produces approximately a 20% gain in overall production due to the passage of greater lengths of roving through the rover in any given period of time. This startling gain is accomplished without increase in loss of fiber, without reduction in machine efficiency, and without fiber breakage. In addition, the subsequent spinning operation is benefitted. No other condenser observed has comparable construction and the efficiency of the structure I have devised has been surprising and unexpected. From the above it will be understood how the objectives of my invention have been met.

Primary to achieving these results appear to be the following factors:

(1) Best results will be obtained if the circumferences of the areas of the condensers over which the rovings bend, as **74, 76**, are directly related to the lengths of the free zones of the associated rovings. This will mean that the longer roving will be subjected to a greater turning action by the associated condenser. Thus, in the examples given, the longer roving **14** (having a 12" free zone) is associated with a larger diameter condenser (diameter E is approximately 1.13") and the shorter roving **16** (having a 7¾" free zone) is associated with a smaller diameter condenser (diameter E is approximately 0.9").

(2) However, the twisting action imparted to the rovings is also dependent on the angle of the bend of the rovings over the condenser. In the examples given herein, roving **14** approaches condenser **20** at an angle of 58 degrees with the vertical and the conical wall **70** is approximately 49 degrees from the vertical resulting in a bend in roving **14** of about 9 degrees. Roving **16** approaches condenser **22** at an angle of approximately 37 degrees with the vertical and conical wall **72** approximately 23 degrees from the vertical, resulting in a bend in roving **16** of about 14 degrees. As stated before, if condenser **22** is placed on the front flyer head, this results in excessive twist when the roving is bent about 35 degrees. This demonstrates that the circumference of the condenser is not totally responsible for the twisting action because a greater twist was achieved although the smaller diameter condenser **22** was placed on the front flyer head. Yet the diameter of the condenser will be understood to affect the amount of twisting action imparted. If a condenser is used having approximately the same diameter as the flyer head, the results described above will not be achieved, e. g., the speed of drafting cannot be substantially increased and the yarn will not have a comparable false twist. The diameter of areas **74, 76** should be at least double the diameter of the interior of hollow flyer head **32**. For the purpose of some of the claims, it is stated that the roving bends over the condenser at least five degrees and not more than 25 degrees. This range is operative and best results will be achieved closer to the examples given of nine and fourteen degrees.

(3) The condensers should be formed of rubber-like material of the specified durometer hardness or another material having an equivalent friction, i. e., a knurled surface of the same hardness or with an abrasive additive will have a greater turning action on the yarn than a plane surface.

(4) The interior walls **70, 72** should not form a lesser angle with the vertical than the associated rovings so as not to interfere with the bending action of the condenser on the rovings.

Having thus described my invention, I wish to cover those variations in design which will occur to those skilled in the art and which are within the scope of the invention disclosed herein, as defined in the appended claims.

I claim:

1. The improvement in a roving assembly in which a pair of textile fiber rovings lead from the nips of delivery drafting rollers of a roving frame to the rotating hollow heads of a front and a back flyer, comprising: an annular condenser of resilient material mounted on each flyer head having an upper central opening through which the associated roving passes into the flyer head, the wall of the central opening from the top of the flyer head to adjacent the top of the condenser being of inverted unbroken frusto-conical shape tangential with a more widely flaring curved edge, the angle of each roving with the vertical being different and being at least five and not more than twenty-five degrees greater than the angle with the vertical of the conical wall of the associated condenser, whereby the roving is bent over the upper margin of the conical wall, the circumference of each conical wall in the plane of the bend of the associated roving being different with the roving having the longest free zone between delivery rollers and flyer head requiring a condenser of larger circumference and both circumferences being at least double the circumference of the interior of the flyer head.

2. The improvement in a roving assembly in which a textile fiber roving leads from the nip of delivery drafting rollers of a roving frame to the rotating hollow head of a flyer, comprising: an annular condenser of resilient material mounted on said flyer head having an upper

central opening through which the roving passes into the flyer head, the wall of the central opening from the top of the flyer head to adjacent the top of the condenser being of inverted unbroken frusto-conical shape tangential with a more widely flaring curved edge, the angle of the roving with the vertical being at least five and not more than twenty-five degrees greater than the angle with the vertical of the conical wall, whereby the roving is bent over the upper margin of the conical wall, the circumference of the conical wall in the plane of the bend of the roving being at least double the circumference of the interior of said hollow flyer head.

3. The improvement in a roving assembly in which a pair of textile fiber rovings lead from the nips of delivery drafting rollers of a roving frame to the rotating hollow heads of a front and a back flyer, comprising: an annular condenser of resilient material mounted on each flyer head having an upper central opening through which the associated roving passes into the flyer head, each central opening having an annular, unbroken upwardly-flaring wall over which the associated roving is bent at a substantial angle, the circumference of each upwardly-flaring wall in the plane of the bend of the associated roving being different with the roving having the longest free

zone between delivery rollers and flyer head requiring the larger circumference.

4. The improvement in a roving assembly in which a textile fiber roving leads from the nip of delivery drafting rollers of a roving frame to the conventional rotating hollow head of a flyer, comprising: an annular condenser of resilient material mounted on said flyer head having an upper central opening through which the roving passes into the flyer head, the central opening having an annular unbroken upwardly-flaring wall over which the associated roving is bent at a substantial angle, the circumference of the upwardly-flaring wall in the plane of the bend of the roving being at least double the circumference of the interior of said hollow flyer head.

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