June 13, 1967 W. A. KLUTTZ 3,324,643

AIRBORNE SPINNING OR TWISTING RING AND TRAVELER

Filed Oct. 13, 1964 2 Sheets-Sheet 1

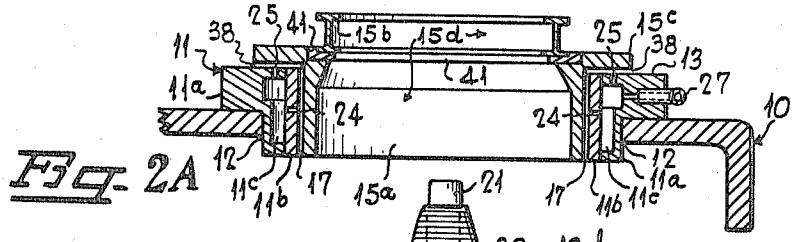


Fig. 2A

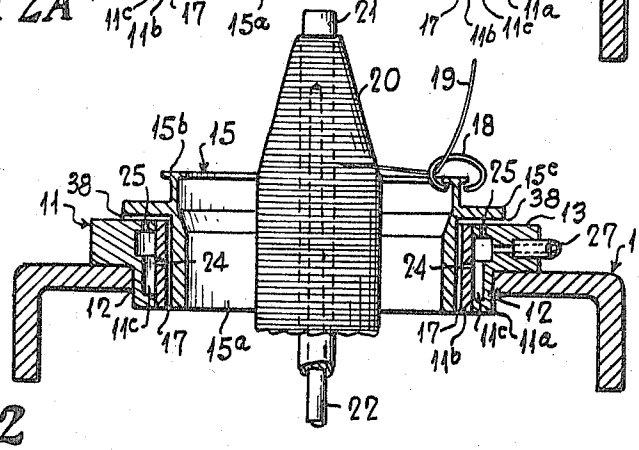


Fig. 2

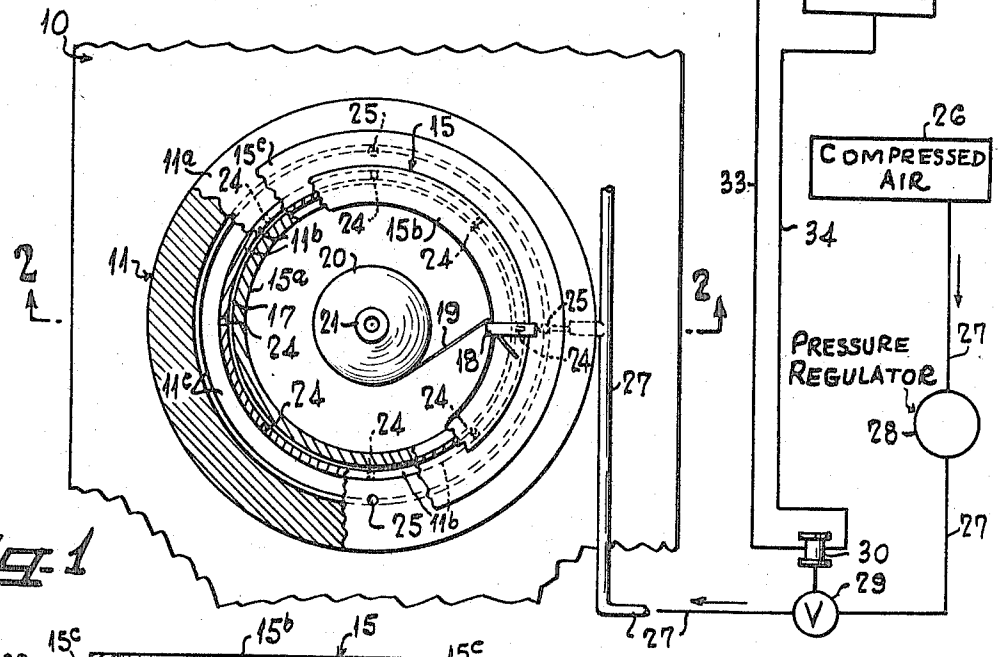


Fig. 1

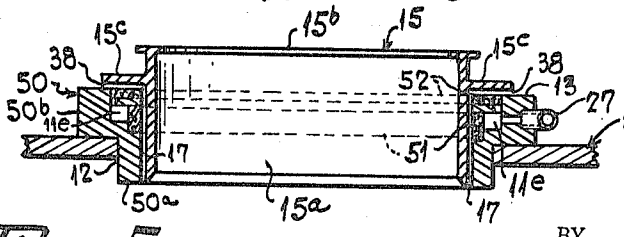


Fig. 5

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AIRBORNE SPINNING OR TWISTING RING AND TRAVELER

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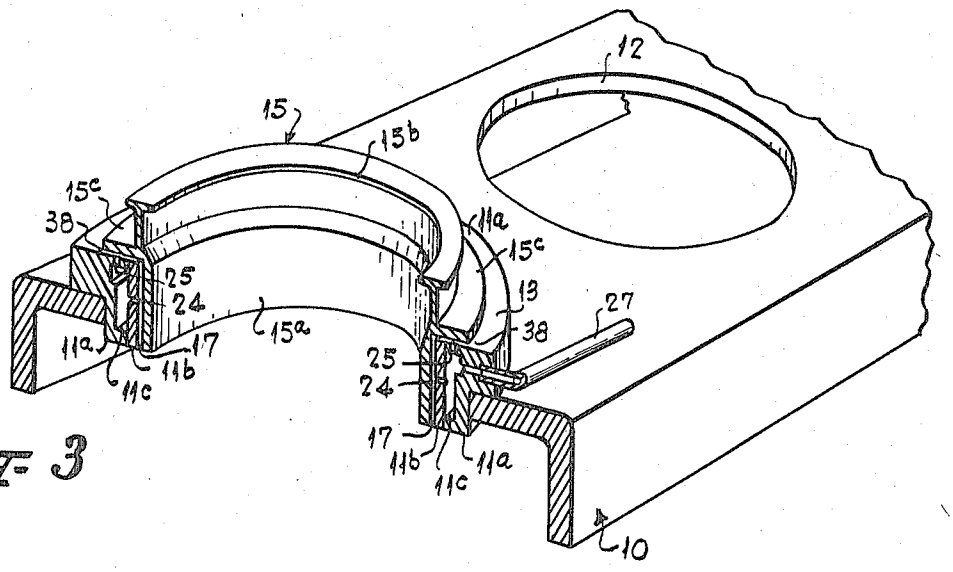


Fig. 3

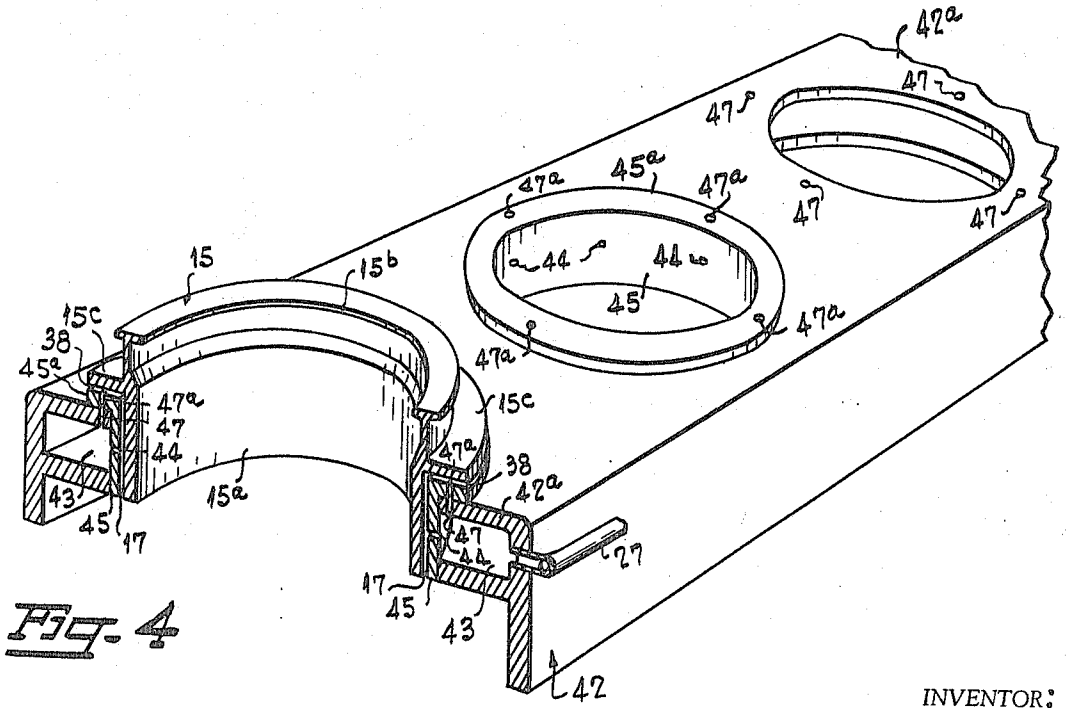


Fig. 4

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3,324,643
AIRBORNE SPINNING OR TWISTING RING AND TRAVELER

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6 Claims. (Cl. 57—124)

This invention relates to a spinning or twisting ring assembly and more particularly to the type wherein the ring is rotatable and airborne during operation.

It is an object of this invention to provide a rotatably mounted spinning or twisting ring having a traveler mounted for movement thereon wherein the friction between the ring and its holder or support is less than that between the ring and traveler during optimum operating speeds.

It is another object of invention to provide a ring assembly of the type described in which the friction resisting the rotation of the ring decreases from a point greater than to a point lesser than the friction between the traveler and ring during acceleration of the ring speed from starting position to its optimum speed, and in which this same friction correspondingly increases as the ring speed decelerates to a stop. Thus, at the beginning and at the end of a spinning cycle as the ring speed accelerates and decelerates respectively, the traveler slides relative to the ring because the spindle around which the yarn is wound rotates faster than the ring during acceleration and slower during deceleration. During the intermediate portion of the cycle, the ring and traveler rotate substantially at the same rate. It is during the above-mentioned periods of acceleration and deceleration that the traveler functions to regulate the yarn tension so as to produce substantially the same twist in the end portions of a yarn package as that in the intermediate portion. The progressively increasing friction which occurs at the end of a spinning or twisting cycle further serves as a brake to hasten the deceleration of the ring speed.

Heretofore, it has been proposed to employ air for rotatably supporting yarn twisting rings for installations in which the centrifugal force of a ballooning yarn strand is used instead of a traveler as a connection between the strand and ring and in which the ring is rotated and retarded by auxiliary power sources (see Patent Nos. 2,796,726 and 2,932,152). Obviously, the centrifugal force between the ballooning strand and the ring is almost negligible during the initial ring acceleration from starting position, and therefore, auxiliary power sources are necessary so that the strand will adhere to the ring and have the desired twist imparted thereto. Likewise, the centrifugal force between the ballooning strand and ring is similarly ineffective during deceleration of the ring speed.

It is a further object of invention to combine an air manifold as an integral part of a ring rail so as to supply air to a plurality of ring assemblies in lieu of the provision of a manifold in the ring holder of each assembly.

It is yet another object of invention to provide an airborne spinning or twisting ring which is rotated solely by the torque produced by its associated centrifugally actuated ring traveler.

Some of the objects of invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which:

FIGURE 1 is a plan view, partly in section and partly schematic, showing my improved ring assembly mounted on the ring rail of a spinning or twisting frame;

FIGURE 2 is a sectional view taken along line 2—2 in FIGURE 1;

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FIGURE 2A is a sectional view similar to the upper central portion of FIGURE 2, but showing a ring of smaller diameter mounted in the same ring holder;

FIGURE 3 is a perspective view, partly in section, showing further details of the assembly illustrated in FIGURES 1 and 2;

FIGURE 4 is a perspective view, partly in section, showing a modified form of invention in which the ring rail has a manifold incorporated therein as a common source of pressurized air for a plurality of ring assemblies made in accordance with the invention, and

FIGURE 5 is a vertical sectional view of another modified form of invention wherein a porous metallic filter is employed in supporting the ring upon an air cushion.

Referring more specifically to the drawings, the numeral 10 denotes the ring rail of a spinning or twisting frame, said rail having an annular flanged ring holder 11 secured thereto as at 12 by any suitable means such as a pressed fit (FIGS. 1 and 2). Ring holder 11 has a vertically disposed bore therein in which is rotatably mounted the lower skirt rim or margin portion 15*a* of an annular spinning or twisting ring 15, the outside diameter of portion 15*a* being smaller than the inside diameter of the ring holder bore so as to provide an annular clearance 17 therebetween of about .001".

The upper portion of ring 15 is provided with a conventional horizontal flange 15*b* upon which a traveler 18 is mounted; and the intermediate portion of the ring has a peripheral flange 15*c* which overlaps the upper horizontal surface 13 of the ring holder 11. Traveler 18 is adapted to be moved around and in sliding engagement with ring flange 15*b* under the influence of a yarn strand 19, said strand passing downwardly in a well-known manner from drafting rolls (not shown), beneath the arch of traveler 18, and then laterally onto yarn package 20. Package 20 is wound upon a bobbin or holder 21 removably mounted upon vertically disposed spindle 22. The ring holder 11, ring 15, yarn package 20, and yarn holder 21 are each substantially concentric with spindle 22.

Ring holder 11 comprises an annular outer portion 11*a* in which an annular inner bushing portion 11*b* is fixedly secured. The inner surface of portion 11*a* has an annular groove 11*c* therein which cooperates with the outer periphery of inner portion 11*b* to form an air supply manifold, said manifold communicating with clearance 17 by means of radially and horizontally disposed openings 24 in the inner bushing portion 11*b*, and also communicating with the lower surface of overlapping ring flange 15*c* through vertically disposed openings 25 in portion 11*a*.

Pressurized gas or air is supplied to manifold 11*c* from compressed air tank 26 by means of a conduit 27, said conduit having a pressure regulator 28 and a control valve 29 therein. Valve 29 is opened and closed by a solenoid 30 which is connected in series with the starting and stopping controls 32 of the spinning or twisting frame by means of electrical conduits 33 and 34. Thus, when the current to the controls 32 is shut off, as by opening a switch 36, the solenoid 30 will be actuated to close valve 29 to stop the flow of gas or air to the ring holder manifold 11*c*.

The ring holder portions 11*a* and 11*b* may be manufactured from metallic or non-metallic material, the choice of materials depending upon the nature and conditions of mill operation.

Each ring holder assembly preferably has four equally spaced vertical holes 25 and eight equally spaced horizontal holes 24, the latter holes radiating from a common manifold 11*c*. The number and size of the holes may vary in order to insure optimum performance so long as the holes are equally spaced.

The air supply line **27** is connected to the annular manifold **11***c* of each ring assembly and the pressure may be as low as one pound per square inch. The air or gas is expelled from manifold **11***c* horizontally and vertically so as to cause the ring **15** to float and freely rotate on a cushion of air. The vertical holes **25** provide the vertical lift while the radial holes **24** provide self-centering action of the ring **15** relative to holder **11**.

The above-described pneumatically suspended ring permits twisting of yarns at speeds considerably in excess of 20,000 revolutions per minute when used in association with the traveler **18**. The traveler is used as a weight tension device to promote the drag necessary to create the winding of the package **20** and also serves as a strand guide. Ring **15** accelerates from a stand-still to a rotational speed of approximately 15,000 revolutions per minute in less than one minute.

At the beginning of a spinning or twisting cycle and until the ring achieves its maximum optimum speed, it is lagging behind the traveler because the friction between the traveler and ring is insufficient to overcome the ring inertia immediately at the beginning; however, when the optimum speed has been attained the traveler and ring will rotate substantially at the same rate thereby eliminating friction and wear between the two elements. By substantially eliminating the traveler-ring wear, it is evident that the principal remaining traveler wear will result from yarn cut.

The air suspension of ring **15** virtually eliminates impingement of the traveler against the ring because the ring floats up and down in the holder in accordance with the amount of yarn tension. Actual mill tests have shown that the number of ends down, or yarn breakage, per 1000 spindle hours is substantially less because of the damping effect of the free-floating ring.

The air or gas which suspends the ring is constantly exhausting from clearance **17** between the ring and holder and from horizontal clearance **38** between the inner opposed surfaces of ring flange **15***c* and the top surface of the holder (FIGURE 2), thereby blowing lint and foreign contamination from the adjacent parts and providing a self-cleaning action.

Should it be required to stop the ring **15** quickly for doffing or other purposes, the air supply is turned off by opening switch **36** (FIGURE 1) causing the ring to seat or settle upon surface **13** of the ring holder during which a progressively increasing braking action occurs. As previously stated, the closing of control valve **29** causes the gas or air supply to cease simultaneously with the cessation of operating current to the spinning or twisting frame. When the air or gas supply is turned off, the ring should cease rotation at approximately the same time as the spindle **22**. Otherwise, the yarn may tangle around the bobbin **21**. However, if instances of entanglement occur, the traveler continues to move around the ring flange a number of revolutions to eliminate the entanglement.

The ring holder **11** may be constructed to accommodate the largest gauge of spinning or twisting frame so that only one basic size of ring holder is employed as shown in FIGURE 2A. By providing an adapter ring **41** for each smaller sized spinning or twisting ring, the ring holder portions **15***a* and **15***c* as well as the supporting ring holder **11** may be used for any size of spinning or twisting ring, thereby adapting the present invention to all existing spinning and twisting machines without major modifications.

The tests conducted with the above-described assembly revealed that the yarn quality was equal to or better than that produced from the conventional types of rings. In other words, the twist per inch, break strength, uniformity, and weight of the yarn compared quite favorably with yarns produced when using conventional rings.

The airborne ring assembly according to the present invention can also be employed without individual ring holders by using a continuous ring rail **42**. Ring rail **42** is channel-shaped in cross-section and comprises a pair of spaced elongated webs **42***a* which are joined together by a pair of spaced transversely disposed elongated flanges to thereby form an elongated manifold chamber **43**. This chamber provides a common source of pressurized air supply for all of the assemblies on the rail (FIGURE 4). At each ring assembly, the spaced webs **42***a* have a pair of alined transverse openings extending therethrough, each pair of said openings having a ring holder bushing **45** secured therein by any suitable means such as a press fit. Chamber **43** communicates with the respective vertically disposed annular clearances **17** by means of horizontally and radially disposed openings **44** in bushing **45** and with the horizontal clearances **38** between flanges **15***c* and **45***a* by means of vertically disposed openings **47**, **47***a*, the latter holes being provided in contiguous horizontal portions **42***a* and **45***a* respectively.

The ring assembly **50** shown in FIGURE 5 is substantially the same as that in FIGURE 2 except for the substitution of annular porous powder metal filter elements **51** and **52** for the horizontal and vertical holes **24** and **25** respectively. The elements **51** and **52** conduct the gas or air from the ring manifold **11***e* and uniformly distribute it around the adjoining clearances **17** and **38**. Filter elements **51** and **52** serve as parts of the lateral supporting surface for rim **15***a* and the vertical supporting surface for flange **15***c* when the gas or air pressure is cut off. Since these supporting surfaces are made of powdered metal which inherently have a higher coefficient of friction, a correspondingly greater resistance will be offered to the rotation of the ring at the end of a spinning or twisting operation.

In the drawings and specification, preferred embodiments of the invention have been disclosed, and although specific terms are employed they are used in a generic sense and not for purposes of limitation, the scope of the invention being defined in the following claims:

1. In combination, a rotatable yarn holder, a spinning or twisting ring concentrically mounted around said holder, a traveler mounted for sliding movement about one end of said ring under the influence of a yarn strand being wound upon said holder, said ring including a cylindrical web having an annular flange integral therewith and lying substantially in a transverse plane intermediate the web ends to thereby provide an L-shaped groove between the flange and the marginal web portion at the other web end, and pneumatic means acting against the adjacent sides of said L-shaped groove for rotatably supporting said ring on a cushion of air to diminish the frictional resistance opposing the ring rotation below the frictional resistance opposing movement of the traveler upon the ring.

2. In combination, a spinning or twisting ring having a cylindrical web with at least one upper flange and one lower flange integral therewith, a traveler mounted for movement on said upper flange, and pneumatic means acting against adjacent surfaces of said web and lower flange, respectively, for rotatably supporting said ring on a cushion of air.

3. In combination, a spinning or twisting ring having a vertically disposed cylindrical web and a laterally extending annular flange on its upper end for receiving a traveler, said web having a second laterally extending annular flange integral therewith and intermediate its upper and lower ends to thereby provide an inverted L-shaped annular groove between the second flange and the web marginal portion therebelow, means for rotatably supporting said ring, said last-named means being provided with an inverted L-shaped annular rim for receiving said groove, and pneumatic means acting laterally against said web marginal portion and upwardly against said second flange to respectively center and suspend said ring relative to said supporting means.

4. The combination as defined in claim 3 wherein said inverted L-shaped annular groove of said ring fits within said inverted L-shaped annular rim of said supporting means.

5. The combination as defined in claim 4 and further comprising a ring rail having an elongated conduit therein, and wherein said supporting means comprises an annular bushing extending transversely across a portion of said conduit and surrounding said web marginal portion, and wherein said laterally acting pneumatic means includes passageways through said bushing.

6. The combination as defined in claim 4 wherein said last-named means includes a porous metallic filter having surfaces respectively flush with the surfaces of said inverted L-shaped rim and disposed opposite the respective surfaces of said second flange and said web marginal portion.

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