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[54] **SPINNING APPARATUS FOR CONTINUOUS OPERATION**

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[51] **Int. Cl.** **D01h 5/28**

[58] **Field of Search**.....57/51–51.6, 77.3–77.45

[56] **References Cited**

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[57] **ABSTRACT**

A spinning apparatus for continuous operation comprises a spindle and a tubular rotary body disposed around the spindle concentrically therewith and driven at a lower speed than the spindle. An untwisted roving supplied from draft rollers is twisted by the rotation of the spindle, then wound on the outer periphery of the rotary body one or several turns and thereafter passed toward discharge rollers continuously.

5 Claims, 4 Drawing Figures

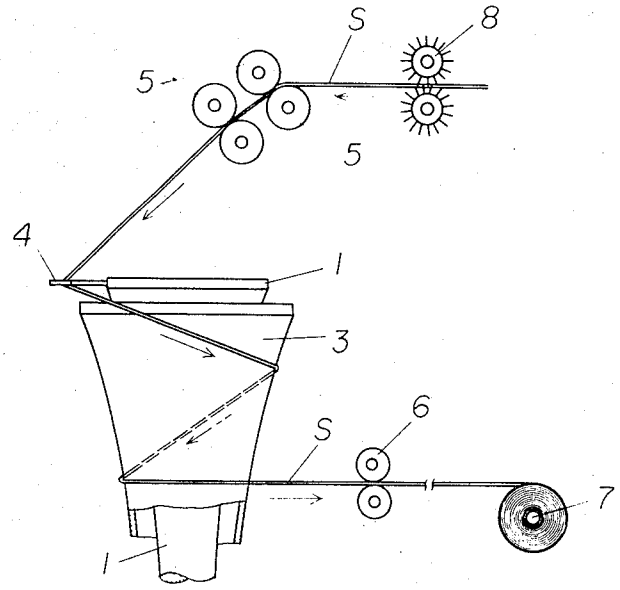


Fig. 1

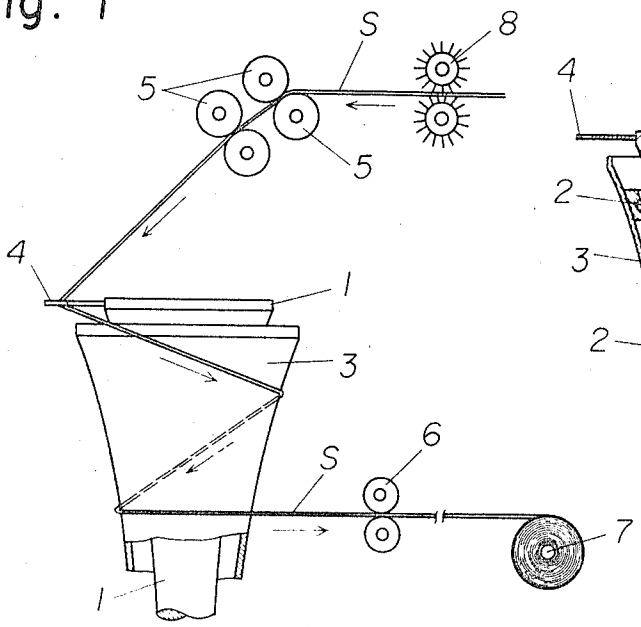


Fig. 2

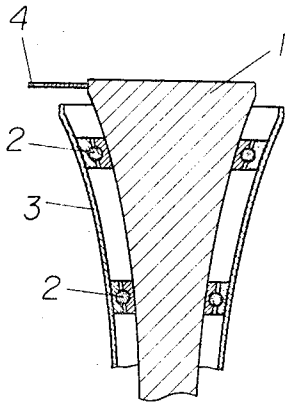


Fig. 4

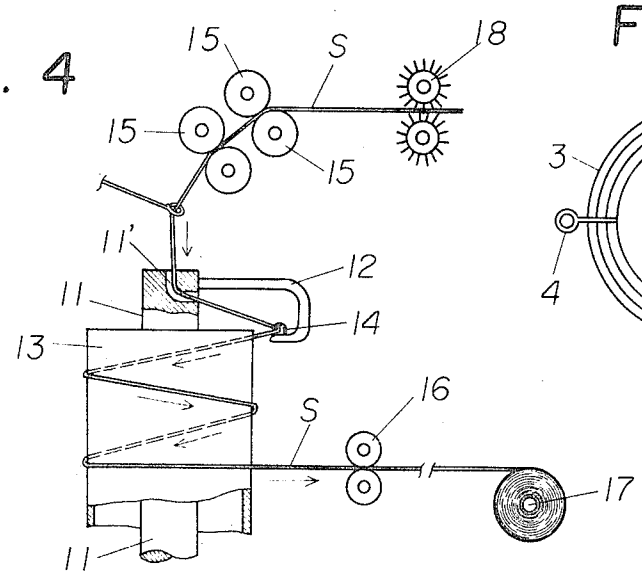
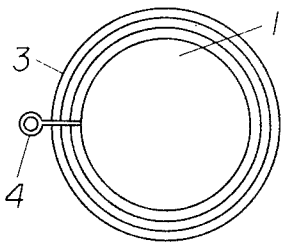


Fig. 3



SPINNING APPARATUS FOR CONTINUOUS OPERATION

The present invention relates to a spinning apparatus for continuous operation.

The conventional spinning apparatus comprises a bobbin disposed subsequent to draft rollers, a ring positioned around the bobbin and adapted to be moved up and down reciprocally and a traveler driven along the ring by the rotation of spindle of the bobbin at a speed lower than the rotational speed of the spindle, whereby the roving is twisted into a spun yarn and wound up on the bobbin. Accordingly, in the case where the spun yarn is subsequently subjected to a finishing process such as dyeing process, there is a need to rewind the spun yarn on a dyeing bobbin after it has been wound up on the spinning bobbin, so that all the processes from spinning process up to finishing process such as dyeing can not be carried out in a continuous operation. Thus, the conventional apparatus has the drawback of low operation efficiency and poor amenability to the saving of labor required for the equipments and for the practice of the processes. In order to eliminate such drawback, an open-end spinning machine utilizing an air stream has been developed which assures improved productivity and significant savings in labor. However, this apparatus is still disadvantageous in that the spun yarn produced is low in tensile strength and is liable to be broken off and that the apparatus requires a high equipment cost.

A primary object of the present invention is to provide a spinning apparatus for continuous operation which permits the spun yarn thereby produced to be continuously and directly fed from the spinning process to dyeing process, doubling and twisting process or like finishing process without the necessity to temporarily wind up the spun yarn on a spinning bobbin and to thereafter rewind the yarn on another bobbin. The apparatus thus assures a continuous operation with high efficiency.

Another object of the present invention is to provide a spinning apparatus for continuous operation which makes it possible to eliminate some of the heretofore indispensable intermediate equipments and processes between the spinning process and finishing process by employing a method other than open-end spinning method and which is capable of producing spun yarns with a higher quality and at an exceedingly lower equipment cost than in the case of the open-end spinning method.

The spinning apparatus for continuous operation in accordance with this invention comprises a twisting mechanism disposed between draft rollers and discharge rollers and composed of a spindle provided externally thereof with a guide ring for a spun yarn and a tubular rotary body surrounding the spindle concentrically therewith, the spindle being driven at a higher circumferential speed than the tubular rotary body whereby the twisted yarn obtained is wound around the outer peripheral surface of the tubular rotary body and then passed toward the discharge rollers.

According to the apparatus of this invention, an untwisted roving is passed through the guide ring on the spindle, then wound one turn or two around the outer peripheral surface of the tubular rotary body and thereafter held between the discharge rollers. When the apparatus is initiated into operation with the roving thus

positioned, the untwisted roving is twisted into a spun yarn between the draft rollers and the guide ring, since the spindle rotates at a higher speed than the tubular rotary body. The spun yarn is passed around the rotary body once or twice, then between the discharge rollers and is thereafter sent to the next process. In this way, a continuous operation is ensured from spinning process up to finishing process, for example, from spinning process up to dyeing process, doubling and twisting process or cheesing process, making it possible to save the time and labor required for rewinding from the spinning bobbin onto another bobbin to achieve efficient production and treatment of spun yarn.

Further the above described continuous operation carried out from the spinning process up to the finishing process in accordance with this invention no longer necessitates a great number of heretofore indispensable bobbins for spinning and dyeing as well as an expensive cheese dyeing apparatus to attain a material reduction in equipment cost, hence a substantial cost reduction in the manufacture of spun yarns. Unlike open-end spinning apparatus, moreover, the present apparatus permits the spun yarn to retain its tensile strength.

For a better understanding of this invention, description will be given with reference to accompanying drawings showing preferred embodiments.

FIG. 1 is a fragmentary side elevation schematically showing a spinning apparatus in accordance with this invention;

FIG. 2 is a side elevation in vertical section showing a twisting mechanism;

FIG. 3 is a plan view of the twisting mechanism; and

FIG. 4 is a fragmentary side elevation partly in vertical section showing another embodiment of the twisting mechanism.

The spinning apparatus for continuous operation of this invention shown in FIGS. 1 to 3 comprises a twisting mechanism disposed between draft rollers 5 and discharge rollers 6. The twisting mechanism includes a spindle 1 in the form of an inverted cone having an upwardly progressively increasing diameter. An upwardly flaring tubular rotary body 3 in the form of an inverted cone is disposed concentrically of the spindle 1 with ball bearings 2 interposed therebetween. At the top of the spindle 1 beside the outer periphery thereof, there is provided a spun yarn guide ring 4 which is mounted on a support extending from the spindle 1 beyond the periphery of the tubular rotary body 3. The spindle is driven at a higher circumferential speed than the tubular rotary body 3, the arrangement further being such that the rotational speeds of the spindle 1, rotary body 3 and cheese bobbin 7 can be adjusted respectively as desired. Combing rollers 8 are positioned before the draft rollers 5.

To operate the spinning apparatus of the above described construction, a roving S from the roving process is passed between combing rollers 8, between draft rollers 5, through the guide ring 4 on the spindle 1 and is then wound around the outer peripheral surface of the tubular rotary body 3 one or two turns. The roving is then passed between the discharge rollers 6, through unillustrated dyeing bath and dryer and is wound up on the cheese bobbin 7. When the roving is thus positioned, the spindle 1, tubular rotary body 3 and cheese bobbin 7 are positively driven, the circumferencial speed of the spindle 1 being higher than that of the tubular rotary body 3. The roving S sent out from the rov-

ing process is untwisted by the combing rollers **8**, then drafted by the draft rollers **5** and thereafter twisted between the guide ring **4** and the draft rollers **5** by virtue of the high speed rotation of the spindle **1**. It is assured that the spun yarn will then be passed onto the outer peripheral surface of the tubular rotary body **3** and guided downward smoothly by virtue of the inverted conical shape of the rotary body **3** while being passed therearound once or twice. The yarn is thereafter moved between the discharge rollers **6** and taken up on the cheese bobbin **7**. This mode of operation ensures continuous operation throughout the whole processes starting with spinning and ending up with winding after the finishing process.

FIG. **4** shows a modified embodiment of the spinning apparatus for continuous operation in accordance with this invention. This embodiment is the same as the foregoing embodiment with respect to construction, operation and advantage except that when the roving sent forward between combing rollers **18** and draft rollers **15** is taken up on a cheese bobbin **17** by way of discharge rollers **16**, the material is passed through a passage **11'** extending from the top face of a spindle **11** to the side face of the top portion thereof and then through a guide ring **14** mounted at the distal end of an arm **12** projecting from the top side face and that a tubular rotary body **13** is in the form of a straight cylinder.

Spinning was conducted in the foregoing mode of operation under the conditions and with the results given in the table below, wherein feeding speed of roving is represented by S; winding-up speed of spun yarn, by W; number of revolution of spindle, by N; twist shrinkage, by α; elongation, by β; number of twist, by $T = n/[S - (\alpha + \beta)/100]$; twist constant, by M; diameter of tubular rotary body, by R (inch); number of revolution of the same, by G; and circumferential speed of the same, by $K = \pi R \times G$.

Item	Unit	Value			
S	inch/min	1020			
W	inch/min	1000			
N	r.p.m.	20000			
α	% estimated	2.5S			
β	% estimated	−0.5S			
T	per inch	20			
M		4.47			
K	inch	995	R 1"	0.75"	0.5"
			G 497.5	746.25	995

It should be understood that this invention is not limited to the principal embodiments which are given above for illustration only. Various modifications will be made by those skilled in the art within the scope of this invention, insofar as they do not depart from the disclosure in the appended claims.

What is claimed is:

1. A spinning apparatus for continuous operation comprising a twisting mechanism disposed between draft rollers and discharge rollers and composed of a spindle provided outwardly thereof with guide ring for a spun yarn and a tubular rotary body surrounding the spindle concentrically therewith, the spindle being driven at a higher circumferential speed than the tubular rotary body whereby the twisted yarn is wound around the outer peripheral surface of the tubular rotary body and then passed toward the discharge rollers.

2. The spinning apparatus for continuous operation as claimed in claim **1** wherein the tubular rotary body is in the form of an inverted cone.

3. The spinning apparatus for continuous operation as claimed in claim **1** wherein the tubular rotary body is in the form of a straight cylinder.

4. The spinning apparatus for continuous operation as claimed in claim **1** wherein combing means is provided before the draft rollers.

5. The spinning apparatus for continuous operation as claimed in claim **1** wherein the guide ring is positioned outwardly of the spindle beyond the periphery of the tubular rotary body and mounted on a support extending from the peripheral side face of the spindle.

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