May 12, 1970 P. K. KORIKOVSKY ET AL 3,511,041

SPINNING AND TWISTING DEVICE

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FIG. 1

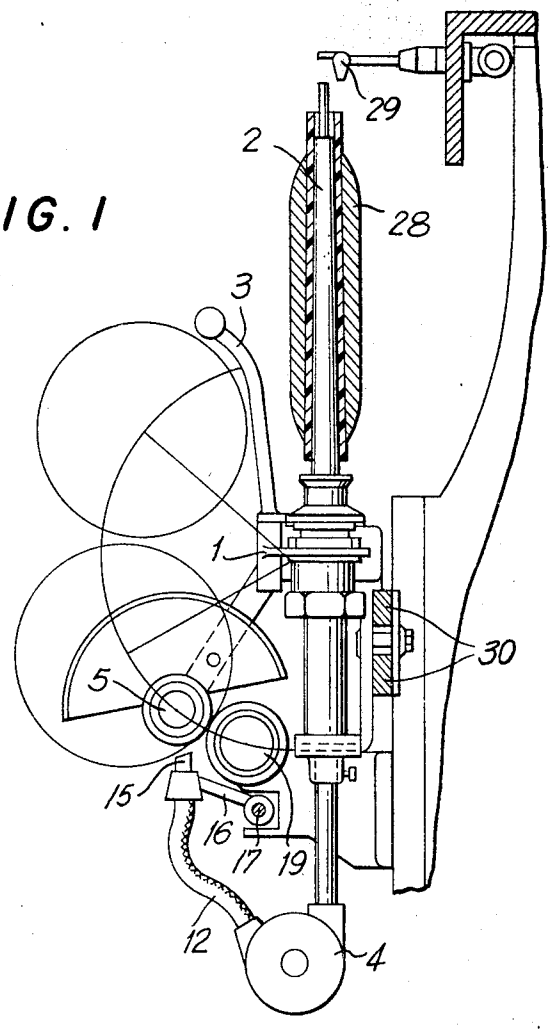

FIG. 5

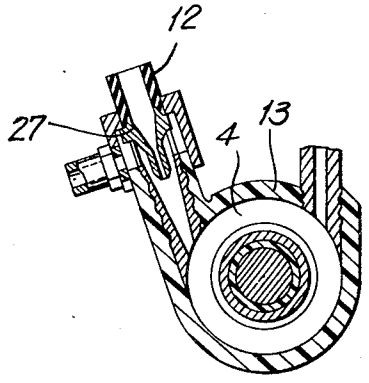

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FIG. 2

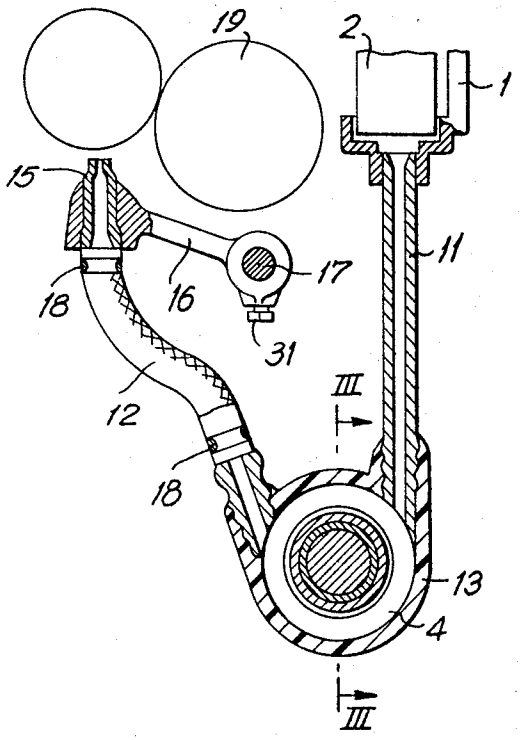


FIG. 3

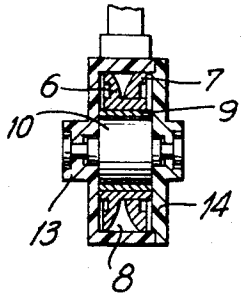
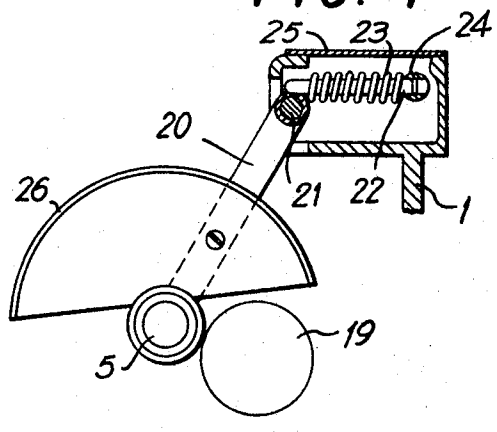


FIG. 4



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SPINNING AND TWISTING DEVICE

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Int. Cl. D01h *13/00*
U.S. Cl. 57—34 7 Claims

ABSTRACT OF THE DISCLOSURE

A spinning and twisting device is provided which can be employed on machines for obtaining twisted thread by the combined spinning and twisting method, the device being a sub-assembly combined in one unit and mounted on a bracket and including a hollow spindle, a brake for said spindle, a tensioning mechanism and a receiving and winding arrangement. The device is provided with a pneumatic system for effecting a threading-up operation, the system being constituted by the channel of the hollow spindle, a tube coupling the tensioning mechanism with the channel of the spindle, a hollow flexible hose in front of a traverse guide and a jacket for the tensioning mechanism.

The present invention relates to spinning and twisting machines for effecting a continuous method of spinning and twisting, and more particularly it relates to spinning and twisting devices of these machines.

Known in the prior art are spinning and twisting machines, in which a spinning and twisting device, comprising a hollow spindle, a spindle brake, a tension mechanism, a traverse guide, and a receiving and winding arrangement are connected to other working members of the machine. This does not allow the use on the machine of bobbins varying as to their height with a twisted thread, but calls for a great number of spinning and twisting machines of various types.

Besides, the lever of the bobbin holder of the receiving and twisting device is of a complicated design, of too large a size, and likely to get out of order during prolonged operation. The existing machines do not possess a mechanism for effecting the automatic setting of the thread, and the latter is set in place by the aid of a metallic pin which is put through the spindle channel.

An object of the present invention is to provide a combined spinning and twisting device which is built as a unit sub-assembly for utilization on new spinning and twisting machines and for converting older existing spinning machines into spinning and twisting machines. It allows the use of bobbins of different height with a twisted thread, and the pneumatic setting-in or threading-up of the thread.

The device according to the invention, operates similar to that in U.S. Pat. No. 3,177,642 and constitutes an improvement thereof. In this type of apparatus a yarn is twisted in one operation as it emerges from the front rolls of the drafting system while simultaneously being doubled with an already twisted yarn carried by a hollow spindle while both yarns are passing through the hollow spindle. The device of this application is an improvement over that in said patent, the improvement residing in a unitized conveying and tensioning system between the hollow spindle and the final cross wound package.

In the spinning and twisting device according to the invention the hollow spindle, its brake, tension mechanism, and the bobbin holder are combined as an independent sub-assembly, and are mounted on a bracket on the machine in a number equal to that of the spindles. The receiving and twisting arrangement and traverse guide are thereby disposed under the spindle, which permits it to free the space under the spindle and thus to employ spindles designed to be used with bobbins of a greater height with a twisted thread.

It is expedient to design the tension mechanism in the form of a roller freely rotating on an axle, said roller being provided with an annular groove for engaging the thread and allowing the passage of air during the threading-up operation. The tension mechanism may be thereby connected to the hollow spindle and traverse guide, and may be provided with a common system for setting in the thread during the threading-up operation.

The proposed design of the tension mechanism allows it to dispense with the use of a traction member, disposed under the spindle of the existing machines, and allows the use of simple and reliable means for setting in the thread to be supplied by a stream of compressed air from the spindle channel into the receiving and winding arrangement.

The connection of the tension mechanism with the hollow spindle is effected through a tube, and with the traverse guide through a flexible hollow hose, the tension mechanism must be thereby enclosed in a jacket connected to said hose and tube. The connection of the jacket through the flexible hose and tube to the traverse guide and hollow spindle allows it, not only to unite said component parts into one sub-assembly having a common pneumatic system for setting in the thread, but also to direct the stream of compressed air into the tension mechanism and to avoid a variable tension which may exit when winding the thread on the bobbin.

In the receiving and winding arrangement, the gear for clamping the bobbin holder to a friction shaft is made in the form of a two-arm spring-loaded lever mounted on a bracket, which permits the extent of clamping of the bobbin holder to the friction shaft to be adjusted, and principally it allows said sub-assembly to be made in small size, it permits the thread to be conveniently set in, and ready allows finished bobbins to be easily removed.

To reduce the time, as required for setting in the thread prior to starting the working operation and for facilitating the pocess of setting in the thread, it is necessary to supply air either through an ejector into a pneumatic system or through an ejector, provided either between the hollow spindle and tension mechanism, or between the tension mechanism and the traverse guide connected therewith.

The spinning and twisting device is designed as an independent sub-assembly mounted on a bracket; this simplifies the construction of the machine and renders more easy the mounting of the machine. Also it enables rapid conversion of any spinning machine with a varying pitch of the spindles to a spinning and twisting machine. The common pneumatic system allows thereby the process of setting in the thread prior to the working procedure to be accelerated and rendered more easy.

The use of the proposed device allows it to simplify the design of the machine, to facilitate its servicing and to improve its appearance.

Other objects and advantages of the present invention will become more fully apparent from a consideration of the following description of an exemplary embodiment thereof, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an elevation view, partly in section, of the spinning and twisting device according to the invention;

FIG. 2 is a cross-sectional view of the tension mechanism of the device according to the invention;

FIG. 3 is a cross-sectional view taken on the line III—III of FIG. 2;

FIG. 4 is a sectional view of a gear for clamping the bobbin holder to a friction shaft in the device according to the invention; and

FIG. 5 is a sectional view of an ejector, provided in the device for effecting the supply of air when setting in the thread according to the invention.

The spinning and twisting device is essentially an independent sub-assembly mounted on a bracket **1** (FIG. 1), said sub-assembly comprising a hollow spindle **2**, a brake **3** of said spindle **2**, a tension mechanism **4**, and a bobbin holder **5**.

The receiving and winding arrangement and traverse guide are disposed in front of the spindle **2**. Said elements are united into an independent sub-assembly mounted on the bracket, and the receiving and winding arrangement is located in front of the spindle. This allows an easy and rapid conversion of any spinning machine into a spinning and twisting machine. The process of forming a twisted thread on such spinning and twisting machines is similar to that described in U.S. Pat. No. 3,177,642.

Mounted on the hollow spindle **2** is a bobbin **28** with a single twisted thread. At the upper end of the hollow spindle **2** the single thread unwound from the bobbin **28** is pieced up with the roving that emerges from a drafting mechanism (not shown). Due to the rotation of the spindle the roving between the drafting mechanism and the point of its being pieced up with the thread unwound from the bobbin **28** is subjected to a torque, i.e., spinning is thus effected. Below the point of connection of said roving thus twisted and said thread the latter due to the rotation of the spindle are twisted into one thread, i.e., twisting is thus effected. The twisted thread obtained through tensioning mechanism **4** is fed to the receiving and winding arrangement.

The device is further provided with a pneumatic system to facilitate the threading-up operation, said pneumatic system being constituted by the channel of the hollow spindle **2**, a tube **11**, a hollow hose **12** and jacket **13** of the tensioning mechanism, the tensioning mechanism being associated with the channel of the hollow spindle through the tube and with transverse guide **5** through the hollow hose.

The tension mechanism **4** of the device is essentially a friction roller, composed of two parts **6** and **7** (FIG. 3) which form, when united, a shaped annular groove **8** for receiving the thread and allowing compressed air from the pneumatic system to pass when setting in the thread. This roller is freely mounted on an axle **10** together with a bearing **9**. The weight of the roller, its diameter, and the coefficient of friction of the twisted thread in the groove **8** of the roller and in the bearing **9** are selected in such a manner as to establish a friction moment at the axle **10** causing braking of the roller during its rotation by the twisted thread thereby providing for its required tension. The tension mechanism **4** precludes the possibility of a single thread being wound onto the receiving bobbin **5** in the event that thread unwound from bobbin **28** or the roving becomes broken. At the moment when either of the threads is broken, the second one also breaks, because one thread, being untwisted in the channel of the spindle **2**, is incapable of overcoming the friction for the rotation of the roller.

Hence, the winding of a single untwisted thread on the receiving bobbin is prevented.

The tension mechanism **4** (FIG. 2) is connected through tube **11** to the hollow spindle **2**, and through the hollow flexible hose **12** to the traverse guide, this tension mechanism together with the above-said units defining a common pneumatic system for setting in the thread. The jacket **13**, made of a transparent plastic material, accommodates said tension mechanism **4**.

The jacket **13** is provided with a cover **14** (FIG. 3) for protecting the tension mechanism **4** (FIG. 2) against dust and lint. The tube **11** is forced into the jacket **13** on one side, while forced into the other side is the flexible hose **12**. The tube **11** is thereby employed for fastening the tension mechanism **4** to the bracket **1** and for guiding the air flow.

The hollow hose **12** terminates at traverse guide **15** which is connected through a bracket **16** to a bar **17** which reciprocates guide **15**. The traverse guide **15** is essentially a metal funnel with a slot to effect the automatic introduction of the thread after it has been taken by the receiving and winding arrangement.

The flexible hollow hose **12** is intended for supplying the thread by a stream of air into the receiving and winding arrangement, as well as for compensating the periodical variation of the thread tension which is produced by spreading the thread along the bobbin to be wound on account of a variation in the length of the thread section found between the tension mechanism **4** and the point of running-on of the thread onto the bobbin **5**. This is achieved owing to a constant length of the flexible hose **12** calculated for the maximum length of the thread section in one of the extreme positions of the traverse guide **15**. When the guide **15** is moving to its middle position, the hose **12** is constrained to bend, thereby making the length of the thread section preserve its constant value.

To prevent the thread from touching the internal surface of the flexible hose **12**, there are inserted into the latter rings **18** made of steel or other material that is not likely to be cut by the thread in the course of a prolonged operation. The flexible hose **12** with the rings **18** can be replaced by a compression spring whose turns tightly adjoin each other (not shown in the drawing).

The receiving and winding arrangement is composed of a friction shaft **19** (FIG. 1), bobbin holder **5**, and a mechanism for clamping the bobbin holder **5** against the friction shaft **19**.

The mechanism for clamping the bobbin holder **5** against the friction shaft **19** is essentially a two-arm spring-loaded lever **20** (FIG. 4) having a roller of the bobbin holder **5** secured thereon and rotating on a bearing.

The two-arm lever **20** is mounted on the bracket **1**, and freely rotates about an axle **21** as the bobbin is built up. Articulated to the short arm of the lever **20** is a guide member **22** with a compression spring **23** thereon. The guide member **22** together with the spring **23** thereon is inserted into a through hole of an axle **24** which is freely rotatable in the bracket **1**.

The compression spring **23** rests with one of its ends against the short arm of the lever **20**, while its other end rests against the movable axle **24**. When the lever **20** is rotating about the axle **21**, the spring **23** is either compressed or released; the guide member **22** is thereby moving inside the hole of the axle **24**. Acting in such a manner on the short arm of the lever **20**, the compression spring **23** clamps the bobbin holder **5** against the friction shaft **19**; and when the lever **20** is thrown up to the rest position, the compression spring retains the ready wound bobbin in its upper position, thereby facilitating the removal of the bobbin. The length of the arms of the lever **20** and the compression spring **23** are selected in such a manner as to provide the necessary clamping of the bobbin holder **5** against the friction shaft **19** during the winding of the bobbin and to retain the lever **20** together with the ready wound bobbin in the upper position when re-

moving it therefrom. The mechanism for clamping the bobbin holder allows adjusting of the spring **23** and hence of the clamping force of the bobbin against the friction shaft, thus permitting the provision of a more convenient removal zone when throwing up the lever **20** and the individual removal of the bobbins at each working location. The mechanism for clamping the bobbin holder **5** is closed with a cover **25** for protecting it against dust and other foreign substances.

Secured on the two-arm lever **20** is a transparent cover **26**, closing the top of the bobbin being wound on the bobbin holder **5**, thus protecting it against soiling by fluff.

Air is supplied into the pneumatic system for setting in the thread by means of an ejector **27** (FIG. 5) provided between the tension mechanism **4** and the traverse guide connected therewith.

The ejector **27** produces vacuum in the flexible hose **12** by sucking in the thread from the receiving bobbin into the funnel of the traverse guide **15** and passing the air through the tension mechanism **4** and the spindle channel **2** in the direction opposite the direction of the thread travel.

The ejector may be placed between the tension mechanism **4** and the hollow spindle **2** (not shown in the drawing), thus producing vacuum in the channel of the spindle **2** and sucking a loop from bobbin **28** (FIG. 1) into the spindle channel, and passing air through the tension mechanism **4**, flexible hose **12**, traverse guide **15**, to the receiving and winding arrangement in the direction of the travel of the thread.

Compressed air is also supplied through a hollow thread guider **29** (FIG. 1) provided between the drawing device of the machine and the spindle **2**. By making the spout of the thread guider **29** coincide with the channel of the spindle **2**, a stream of compressed air can be passed into the spindle channel, to feed thread to the receiving and winding arrangement in the direction of the travel of the thread.

Compressed air is supplied into the pneumatic system according to any of the above-mentioned embodiments only at the moment when a threading-up operation is to be effected.

When converting a spinning machine into a spinning and twisting one, a spindle bar with spindles, annular strip and mechanism for lifting the annular strip are to be removed. In place of the removed parts and mechanisms, two strips **30** are arranged along the whole machine, and secured thereto are the brackets **1** having the spinning and twisting sub-assemblies mounted thereon.

The number of the brackets **1** thereby corresponds to that of the spindles provided on the machine. When the final transmission is slightly varied, the friction shaft **19** and space cam (which is not shown in the drawing) are driven in motion, thereby reciprocating the bar **17** of the traverse guide. The brackets **16** (FIG. 2) are secured on the bar **17** of the guide **15** by a stop screw **31**. The place where the brackets **16** are secured to the bar **17** is adjusted in the process of the machine operation.

The spinning and twisting device operates as follows.

Mounted on the hollow spindle **2** is bobbin **28** with a single thread that is twisted. At the upper end of the hollow spindle **2** the single thread unwound from the bobbin **28** is pieced up with the roving that emerges from the drafting mechanism. Due to the rotation of the spindle, the roving between the drafting mechanism and the point of its being pieced up with the thread unwound from the bobbin **28** is subjected to a torque, i.e., the spinning process is effected. Below the point of connection of said thread and the twisted roving the latter due to the rotation of the spindle are twisted into one thread, i.e., the twisting process is effected. The obtained thread passes through the tensioning mechanism **4** and is fed into the receiving and winding arrangement.

When a thread is broken or a bobbin is replaced, the handle of the brake **3** is turned, and the spindle **2** is thus stopped. The thread is wound off from the bobbin **28** fitted on the spindle **2**, and is then brought in the form of a loop to the upper end of the spindle **2**. The thread is introduced into the spindle channel by the action of the air from guider **29** and by the vacuum provided in the channel by the ejector, which may be between the hollow spindle and tension mechanism **4**. Then the thread is entrained by a stream of compressed air into the tension mechanism **4** and flexible hose **12** terminating in the traverse guide **15**, and is then fed due to the rotation of the bobbin towards the receiving and winding arrangement where the thread is gripped by the bobbin holder **5** and friction shaft **19**. The bobbin is rotated by the friction shaft and the thread is wound on the bobbin. Thereupon the spindle is set into rotation, while the end of the thread from the bobbin **28** is pieced with a roving from the drafting mechanism. This completes the beginning of the combined process of spinning and twisting.

When being tensioned within a section between the traverse guide **15** and the grip formed by the bobbin and friction shaft **19**, the thread automatically passes into a narrow slot of the traverse guide, which provides for its accurate spreading on the bobbin **5**.

When caught by the rotating bobbin, the thread is tensioned and enters the annular groove **8** of the friction roller of the tension mechanism **4** (FIGS. 2 and 3) to cause the roller to rotate. The energy consumed by the thread for rotating the roller, produces a difference in the thread tension before and after the tension mechanism **4**. By selecting the ratio between the external and internal diameters of the roller, it is possible to adjust the tension of the entering thread in such a manner as, first, to ensure the required density of winding and, secondly, to prevent winding discards due to the enforced breakage of the second thread when the first one is broken even if it is not completely untwisted.

What is claimed is:

1. A spinning and twisting device comprising a bracket; a hollow spindle mounted on said bracket and adapted for receiving thread which is to be spun and twisted with other thread; brake means for said spindle mounted on said bracket; a tensioning mechanism arranged under said hollow spindle; a tube coupling said tensioning mechanism and the channel of said hollow spindle; a friction shaft and a bobbin holder mounted on said bracket in front of said hollow spindle for winding spun and twisted thread onto said bobbin holder, means for pressing said bobbin holder against said friction shaft, a traverse guide arranged in front of said hollow spindle; and a hollow flexible hose connecting said tensioning mechanism and the traverse guide, said friction shaft, bobbin holder and pressing means constituting a receiving and winding arrangement, and said channel of the hollow spindle, said tube, said tensioning mechanism and said hollow flexible hose constituting a conduit for a pneumatic system adapted for effecting a threading-up operation.

2. A spinning and twisting device according to claim **1** wherein said tensioning mechanism comprises a freely rotatable roller provided with a shaped annular groove for frictionally engaging the thread when the latter is wound onto the bobbin and for passing air during the threading-up operation.

3. A spinning and twisting device according to claim **1** wherein said tensioning mechanism comprises an enclosing jacket which receives said flexible hose.

4. A spinning and twisting device according to claim **1** wherein said means for pressing the bobbin holder against the friction shaft comprises a two-arm spring-loaded lever mounted on said bracket.

5. A spinning and twisting device according to claim **1** comprising means for feeding air into the pneumatic system for advancing the thread in the direction of its travel through the channel in said hollow spindle.

6. A spinning and twisting device according to claim 1 comprising ejector means for feeding air into the pneumatic system for advancing the thread, during threading-up, in the direction of thread travel through the hollow spindle.

7. A spinning and twisting device according to claim 1 comprising means for feeding air into the pneumatic system, during threading-up, in a direction opposite to that of normal thread travel during operation, the latter means comprising an ejector between said tensioning mechanism and said traverse guide.

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U.S. Cl. X.R.

57—62