United States Patent

Prochazka et al.

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[54] APPARATUS FOR THE CONTINUOUS SPINNING OF TEXTILE FIBERS

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[52] **U.S. Cl.**.....**57/58.89,** 57/58.95

[51] **Int. Cl.**.....**D01h 1/12,** D01h 7/00, D01h 13/26

[58] **Field of Search**.....57/58.89, 58.95, 78, 82, 84, 57/89, 92, 104, 105

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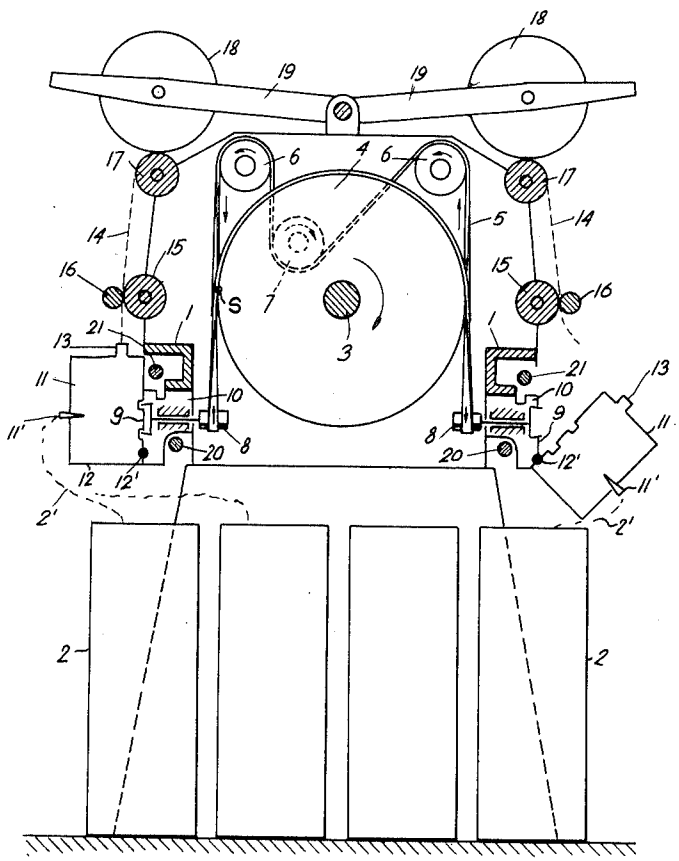
[57] **ABSTRACT**

Apparatus for the continuous spinning of textile fibers by the open end spinning method, particularly by means of a spinning chamber operating under pressure. The separate spinning units of the apparatus are driven by a common drive from which they are separately disengageable. The spinning chamber of each spinning unit is mounted in a stationary body on the machine frame; the separating and feeding mechanisms of each spinning unit are mounted in a body which is generally movable away from the spinning chamber, whereby to improve the ease with which the spinning units may be attended and maintained.

12 Claims, 8 Drawing Figures



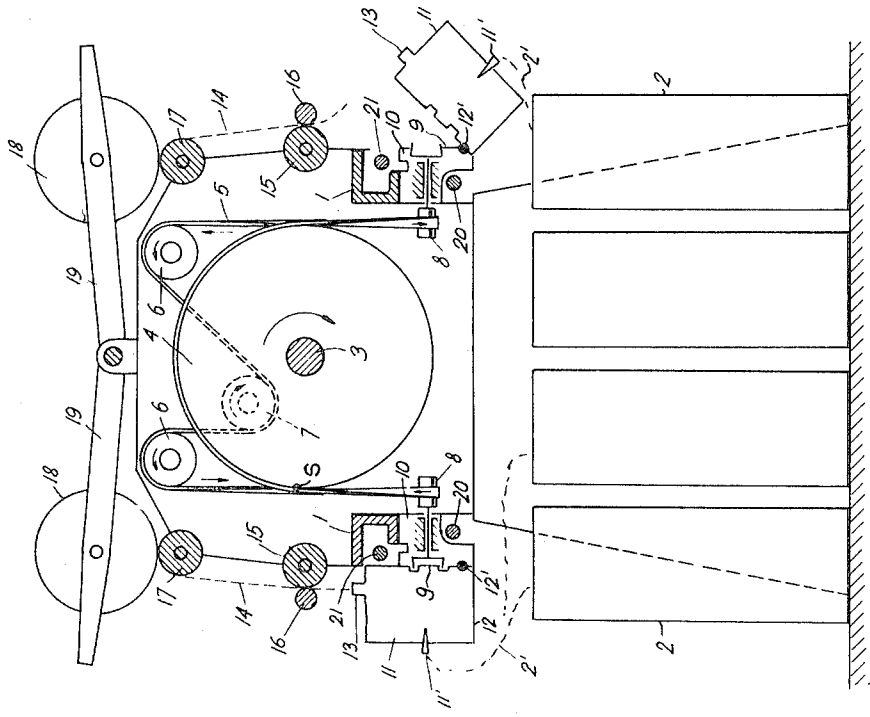


Fig. 2

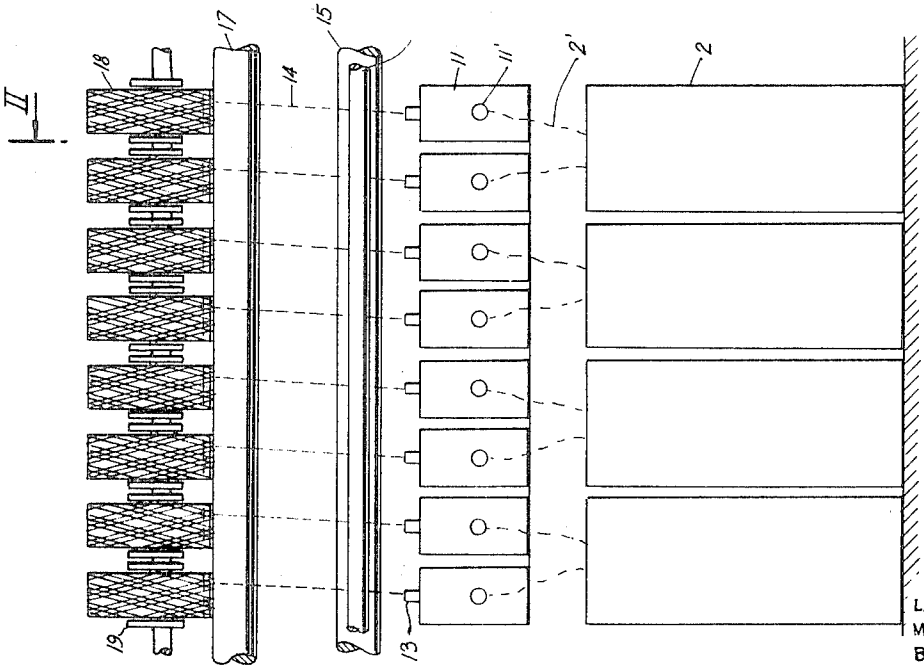


Fig. 1

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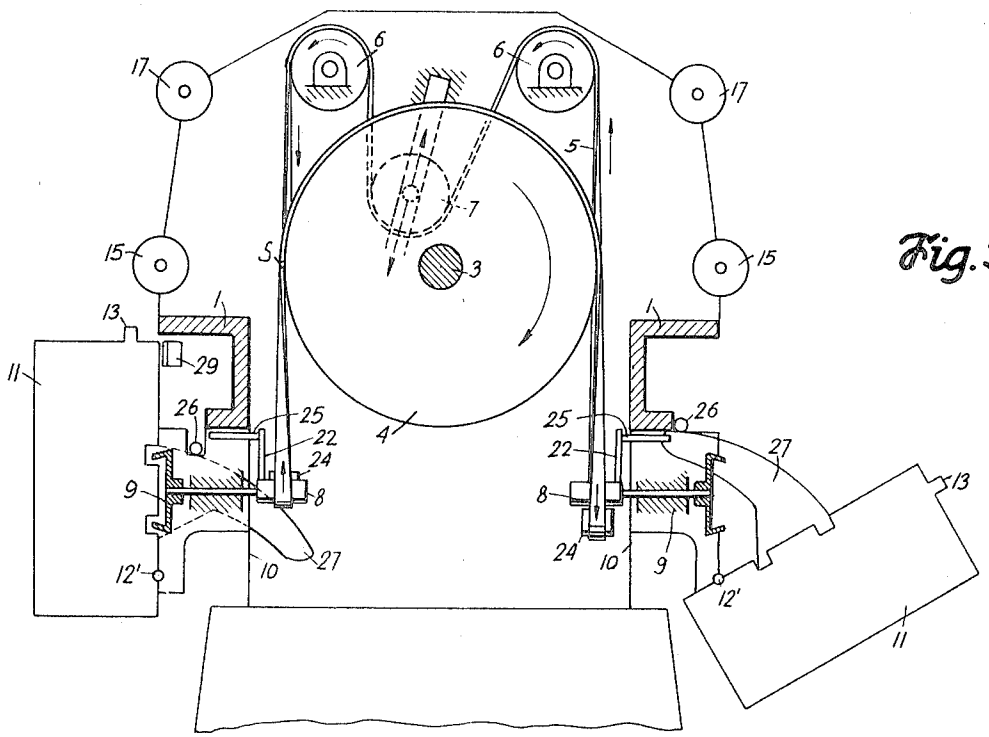

Fig. 3

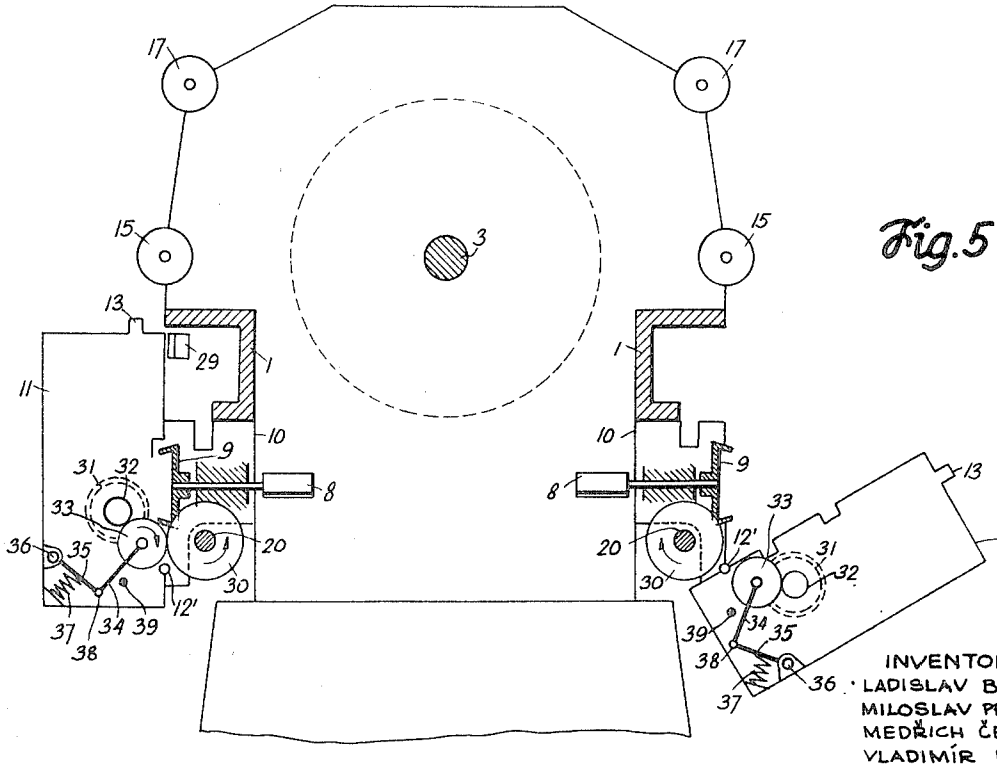

Fig. 5

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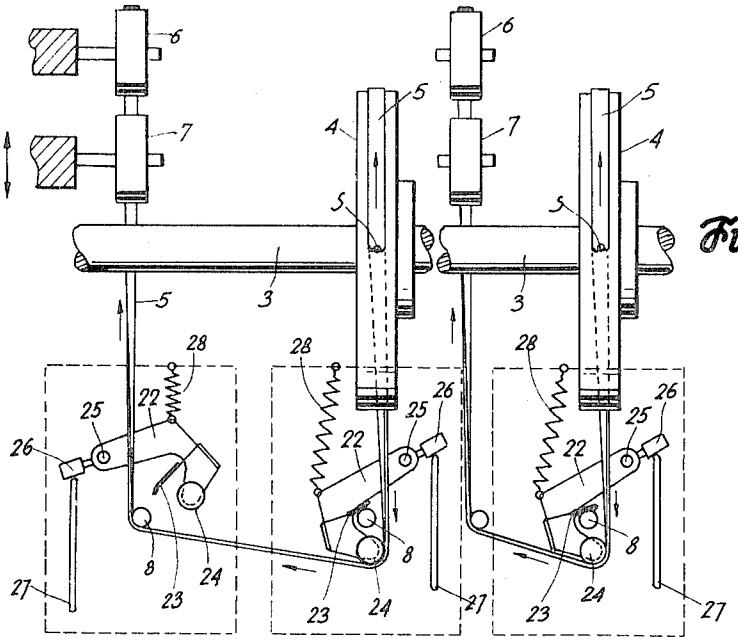

Fig. 4

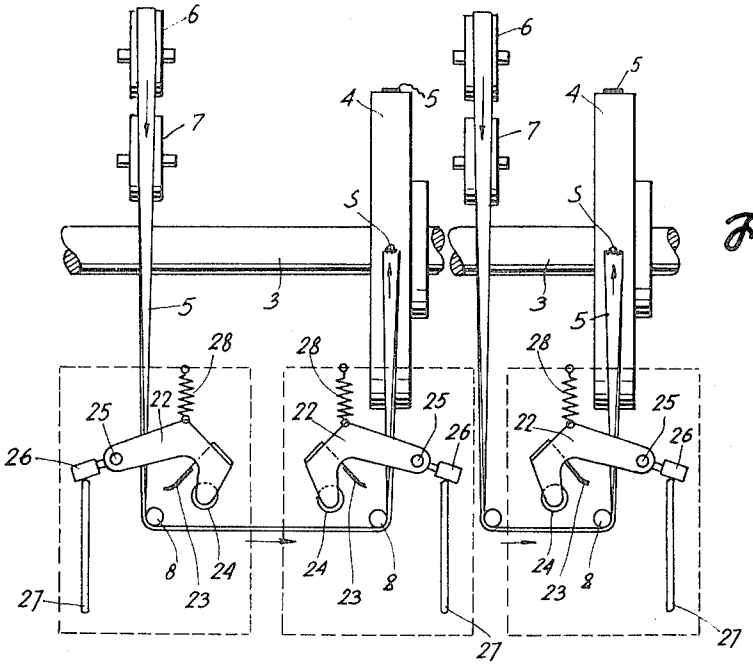

Fig. 4a

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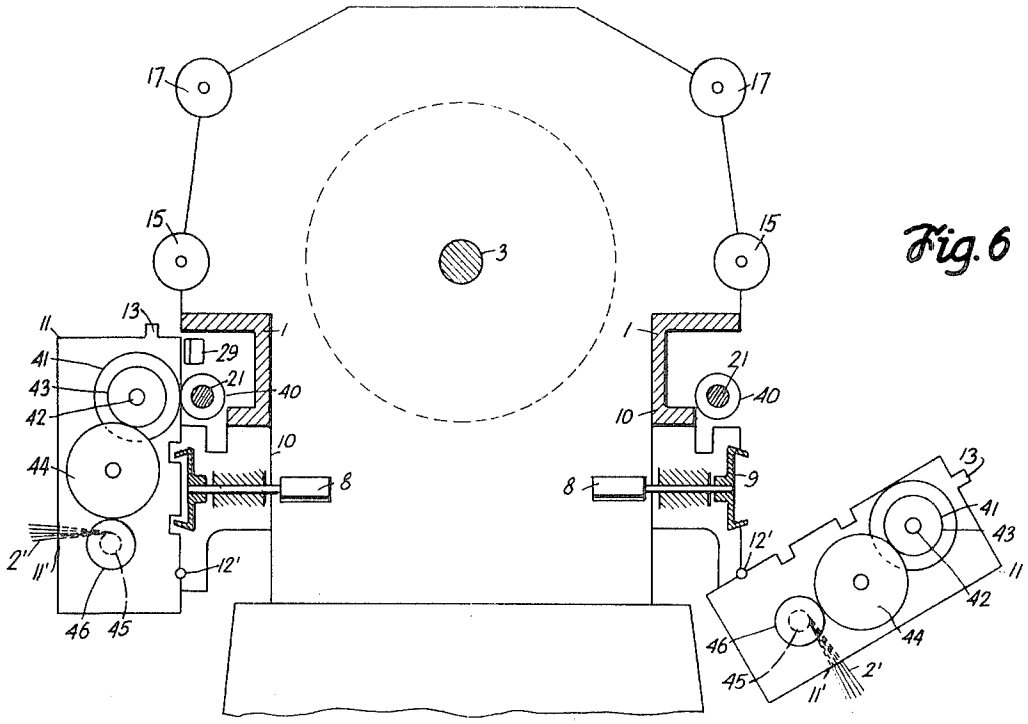

Fig. 6

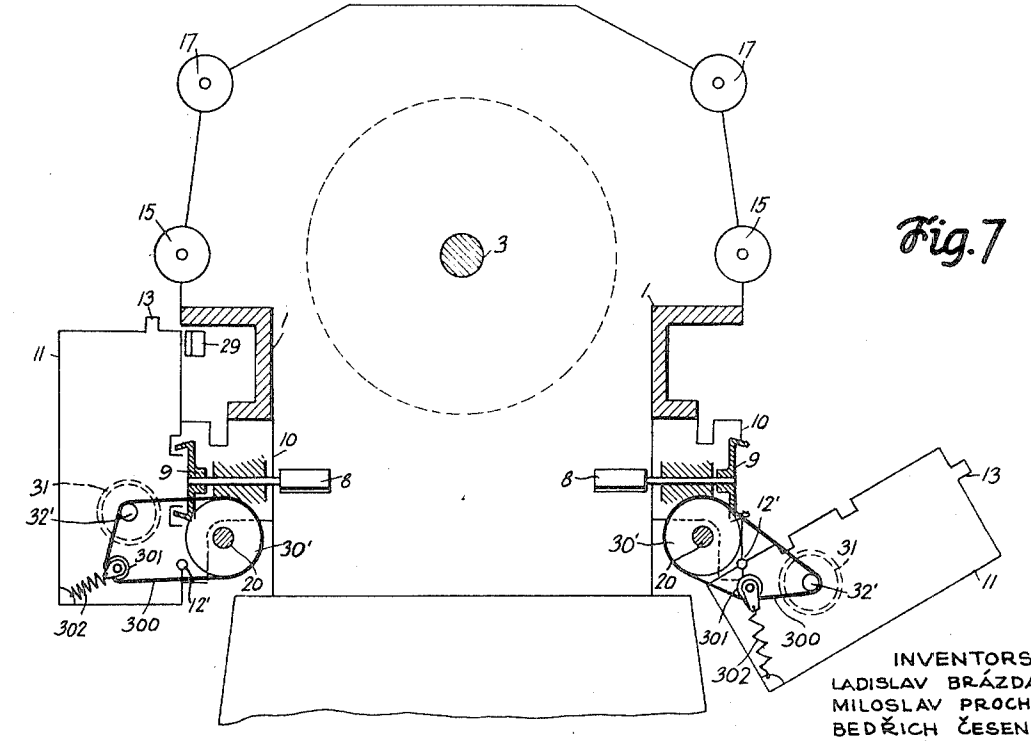

Fig. 7

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APPARATUS FOR THE CONTINUOUS SPINNING OF TEXTILE FIBERS

The present invention relates to a machine for the continuous spinning of textile fibers by the open end spinning method particularly by means of a spinning chamber operating under pressure, the separate spinning units in the machine being driven by a common drive from which they are separately disengageable.

Several embodiments of the machine for the said spinning method are known, such machines differing from each other in the arrangement of the spinning chambers, the separating mechanism, and the feeding mechanism for the fibrous material. As a result of such differences in arrangement of the elements, the machines differ in function, accessability of the separate elements, and in their ease of controllability. In the first known machines of this type, it was necessary as a matter of course partially to disassemble them from time to time, particularly upon the stoppage of the whole machine upon the failure of one of its elements.

As in other textile machines of the same general type, the separate elements and working units of these machines are arranged side by side on one or both sides of the machine. The oldest known machine of this type drives the spinning chambers, the separating mechanism and the feeding mechanism from continuous shafts extending along the whole machine. In order that such construction shall be feasible as a working arrangement, it is necessary to choose such a design that the individual elements may be disengaged from the driving means, and that the separate spinning units may be stopped from operation. Without such features the attendance and the operation of the machine as a whole would not be feasible.

In another known machine of this type, the drive for both the spinning chambers and the separating mechanisms is by means of belts which pass along the whole length of the machine. Machines of this type encounter difficulties, however, when the belt is operated in a horizontal plane. This imposes a considerable radial load upon the bearings of the driven elements. In such construction, the drive is tangential, in which minimum contact of the pulley occurs, particularly at the beginning of the branch of a belt. The body in which the spinning chamber is mounted together with its bearing is swingable; this presents adverse conditions for the removal of heat which is generated by the rotary motion of the spinning chamber, and does not provide optimum stability for a long operating life of the high-speed bearing of the spinning chamber.

The present invention has among its objects the provision of apparatus which is at least substantially free of the above pointed out disadvantages of prior apparatus of this type. In the present apparatus the separate mechanisms of the spinning units are situated in two bodies, one of which is stationary. Further features of the machine according to the present invention are described in the following specification and shown in the accompanying drawings, showing preferred but non-limiting embodiments of apparatus in accordance with the invention.

In the drawings:

FIG. 1 is a fragmentary, somewhat schematic view in front elevation of a first embodiment of apparatus in accordance with the present invention;

FIG. 2 is a view in vertical transverse section through the apparatus, certain of the parts being shown in elevation, the section being taken generally along the line II—II of FIG. 1;

FIG. 3 is a detailed view of a portion of FIG. 2 on a somewhat enlarged scale, the figure particularly showing the drive of the spinning chambers;

FIG. 4 is a fragmentary, somewhat schematic view in side elevation of a portion of the driving mechanism for units at the right-hand side of the apparatus (FIG. 3), the drive for the right-hand two units being shown disengaged;

FIG. 4*a* is a fragmentary, somewhat schematic view in side elevation of a portion of the driving mechanism for units at the left-hand side of the apparatus (FIG. 3), the drive for the units being shown engaged;

FIG. 5 is a detailed view of the apparatus as it is shown in FIG. 2, the view showing a first embodiment of drive of the separating mechanism of the machine;

FIG. 6 is a detailed view of FIG. 2, the view showing the drive of the unit for feeding fibrous material into the spinning units of the machine; and

FIG. 7 is a detailed view similar to FIG. 5 but showing a second embodiment of drive of the separating mechanism of the machine according to the present invention.

It will be understood that the machine of the present invention consists of a plurality of spinning units of similar construction, such units being mounted on the machine in side by side relationship on one or both sides of the machine. Since such spinning units are similar and the drives therefore as well as other portions thereof are the same, a description of one such spinning unit and its apertinent parts will suffice.

In the machine shown there are two longitudinally extending frames **1** on opposite sides of the machine. Other parts of the frame, necessary to the operation of the machine, are omitted from the drawings in the interest of simplicity of illustration. Spinning units, which include stationarily mounted spinning chambers **9**, and fibrous material feeding mechanism **11**, are mounted in outwardly facing position on the respective frame members **1**. As shown particularly in FIGS. **1** and **2**, fibrous material **2'** is fed upwardly from spinning cans **2** into the inlet openings **11'** of the respective spinning units. The yarn **14**, produced by the respective spinning units, travels upwardly through the outlet tubes **13** between feeding rollers **15**, **16** of which the first is in the form of a driven continuous shaft, to be wound upon packages **18** as shown. Such packages or bobbins are supported upon swingably mounted levers or frames **19**, the bobbins being supported upon and driven by driven drums in the form of a continuous shaft **17**. Traverse mechanism (not shown) is provided in the vicinity of the drum **17** to relay the yarn across the bobbins in a cross-wound fashion as shown.

A main drive shaft **3**, which is positioned horizontally and extends longitudinally throughout the length of the machine is rotatably mounted in the upper part of the machine frame. A plurality of driving discs **4** are mounted upon the shaft **3** at regular intervals, in the embodiment shown there being one such disc **4** for each set of two oppositely mounted spinning units **9**, **11**. It is to be understood, however, that within the scope of the invention, each driving disc **4** may drive more than two units. Each driving disc **4** is in operative contact with its respective driving belt **5**, which is guided over guiding rollers **6** mounted on fixed axes and over an adjustable tensioning roller **7**, as well as over the pulleys **8** of the spinning chambers **9** which are mounted stationarily in the bodies **10** on the respective machine frames **1**. Assuming that the shaft **3** and the discs **4** mounted thereon rotate clockwise (FIG. **3**) the belt **5** for driving two opposed spinning units travels as follows: Starting at the point S in FIG. **3**, the belt **5** travels in contact with the disc **4** for 180° after which it leaves in a vertical run and is twisted 90° to run about pulley **8** of the right-hand spinning unit or the belt disengaging pulley **24**, to be described. The belt then rises in a vertical run offset and free from contact with the disc **4** to the right-hand guide roller **6**, being turned 90° in such travel. The belt then travels approximately about such guide roller **6**, downwardly beneath the adjustable tensioning roller **7**, up and partially about the left-hand guide roller **6** and then downwardly and about the drive pulley **8** of the left-hand spinning unit (FIG. **3**). As the belt travels downwardly from the left-hand guide roller **6** to the driving roller **8** it is turned 90°, the belt being restored to the plane of the periphery of the driving disc **4** as it rises from the pulley **8** to engage to disc **4** at the point S.

The bodies **10** together with the spinning chambers **9** mounted therein constitute the stationarily mounted part of the spinning units **12**. The other part of such units, that is, part **11** which is swingably mounted upon pivot pin **12'**, includes feeding mechanism for the fibrous material to be processed (FIG. **6**), and a separating mechanism (FIG. **5**) together with driving trains for such mechanisms, to be described.

As shown in FIGS. 3, 4 and 4a, in the proximaty of each driving pulley 8 of a spinning chamber 9 there is provided an arm 22 which is pivotally mounted upon a pivot pin 25 affixed to frame structure. The arm 22 carries a brake shoe 23 and an idle pulley 24, as shown in FIGS. 4 and 4a. When the arm 22 is in its inoperative position, toward which is constantly urged by a coil tension spring 28, the brake shoe 23 and pulley 24 lie spaced from the driving pulley 8 and the belt 5 respectively. When the arm 22 is swung downwardly into the position shown in FIG. 4, the brake shoe 23 engages the driving pulley 8 and the guiding pulley 24 then underlies the pulley 8 and removes the belt 5 from driving engagement with pulley 8. The arms 22 of the respective spinning units 12 are under control of mechanism associated with the respective swingable part 11 of the spinning unit, the arms 22 being in the position shown in FIGS. 4*a* when the bodies 11 are in their closed, operative position, the arms 22 being swung into the position shown in FIG. 4 upon the opening of the spinning units 12 by swinging the parts 11 outwardly and downwardly.

As shown in FIGS. 3, 4 and 4*a* each of the arms 22 has a portion which projects therefrom outwardly of the pivot pin 25, such projecting portion rotatably mounting rollers 26. Each of the parts 11 of the spinning units 12 has a control member 27 in the form of a segment connected thereto, the upper surface of the segment 27 having a cam surface upon which the roller 26 rests. The configuration of such cam surface is such that cause the roller 26 to descend under the action of the spring 28 when the parts 11 are in the closed position shown at the left in FIG. 3, and to cause the rollers 26 to be raised and thus the arms 22 to be rotated into the position shown in FIG. 4 upon the swinging outwardly of part 11 of the spinning unit in the manner shown in FIG. 3. It is to be understood that other linkage mechanisms whereby the arms 22 are moved from the positions thereof shown in FIG. 4*a* to that shown in FIG. 4 upon the opening of the movable part 11 of the spinning unit 12 may be employed. Among such other linkages may be those including cables, tapes, chains and the like.

The drive for the schematically shown separating mechanisms of the respective spinning units 12, which are mounted in the movable part 11 thereof, is derived from continuous longitudinally extending drive shafts 20 which lie beneath the bodies 10 of the spinning units on both sides of the apparatus. The separating mechanism includes elements mounted inwardly of the part 11 such elements including a driven separating cylinder 31. The separating cylinder 31 is driven by the following elements which are located at one end of the part 11. A driving disc 30 is fixedly secured to the drive shaft 20 at each of the parts 11 of the spinning units. Disc 11 has frictional driving engagement with an intermediate roll 33, which in turn frictionally engages a roller 32 which is affixed to a shaft which extends outwardly through the respective end wall of the part 11. The intermediate roller 33 is rotatably mounted upon the upper end of the first arm 34 of the bell crank having a second arm 35, the outer end of arm 35 being pivotally mounted to the part 11 by a pivot pin 36. A coil compression spring 37 acting between a corner of the part 11 and the arm 35, as shown, constantly urges the intermediate roller 33 into driving engagement with both the disc 30 and the roller 32, as shown at the left in FIG. 5. When the body 11 is swung into inoperative position, as shown at the right in FIG. 5, the intermediate roller 33 pulls away from the disc 30, and so the drive train between the shaft 20 and the separating cylinder 31 is broken.

The feeding mechanism for the fibrous material, and the driving train therefor, are shown in FIG. 6. Such feeding mechanism includes a feeding roller 45 mounted within the part 11. The remainder of the parts are disposed outwardly of the end wall on the part 11. A continuous drive shaft 21 extends along each side of the apparatus as shown. A pinion 40 is affixed to a shaft 21 at the location of each of the spinning units; pinion 40 meshes with a larger pinion 41 which is affixed to a shaft 42 journalled in the side wall of the part 11. Affixed to gear 41 is a smaller gear 43 which is in mesh with a gear 44, likewise mounted upon the wall of the part 11. Gear 44 meshes with a smaller gear 46 which is affixed to the shaft upon which the feeding roller 45 is mounted. When the parts are in their normal, operative relationship they present a continuous drive train, as shown at the left in FIG. 6, from the shaft 26 to the feeding roller 45. When the part 11 is swung outwardly into its inoperative position, as shown at the right in FIG. 6, the gear 41 is disengaged from the gear 40, and so the drive train from the shaft 21 to the feeding roll 45 is broken.

The above-described machine, which is shown in FIGS. 1 to 6 inclusive, functions as follows:

The main drive shaft 3 is rotatably driven by means not shown and thus drives all of the driving discs 4 connected thereto. The discs 4 drive the respective pulleys of the spinning chambers 9 as above described, thereby imparting a rotary motion to the fibers inside the body 10. Yarn 14 being formed by said rotary motion is withdrawn through the outlet 13 in the movable part 11 of the spinning unit 12 by the withdrawing rollers 15, 16 which feed said yarn to the winding cylinder 17 by means of which the yarn is wound upon a bobbin 18. The drive through the driving pulley 8 of each spinning chamber 9 is stopped by swinging of the movable part 11 of the spinning unit 12 outwardly. In its normal working position, each of the movable parts 11 is held by a latching means such as a magnet 29. Upon the swinging out of the movable part 11, the segment 27 moves the arm 22 of the respective spinning unit from the position shown in FIG. 4a into that shown in FIG. 4, whereby to disengage the driving belt 5 from the respective driving pulley 8. At the same time the brake shoe 23 is presented to the driving pulley 8, whereby to bring the spinning part 9 of the unit 12 quickly to a halt.

It will be seen that despite the disengagement of a driving belt 5 from the driving pulley 8 of a particular spinning unit, the main shaft 3 and the driving discs 4 mounted thereon are not stopped. Thus, the spinning units which derive their drive from such particular belt 5 are not stopped from their normal operation. After the particular part 11 which has been moved outwardly is returned into its upright, working position, the pulley 24 is removed from its position between the belt and the driving pulley 8 so that the driving of the part 9 of the spinning unit is resumed.

As above described, both the separating mechanism and the feeding mechanism for each of the spinning units 12 is mounted in the movable part 11 thereof. As above described, upon the swinging outwardly of a part 11 of a spinning unit a driving train to both the separating mechanism and the feeding mechanism therefore are broken. Such driving trains are restored upon the swinging of the part from its outwardly tipped position, shown at the right in FIG. 3, to its upright position, shown at the left in FIG. 3 wherein it is held by the latching means 29.

In FIG. 7 there is shown a drive train for the separating mechanism which may be substituted for that shown in FIG. 5. The drive train shown in FIG. 7 differs from that of FIG. 5 primarily by the substitution of a belt driving means for a gear train. In the embodiment of FIG. 7 a pulley 30′ is mounted upon the drive shaft 20 in the vicinity of each of the spinning units 12, the pulley 30′ driving the separating drum 31 by means of a belt 300 which is entrained there over and over a pulley 32′ affixed to the outer end of the shaft which mounts the separating drum 31. The belt 300 is kept tight by the tensioning roller 301 which is pulled outwardly or forwardly by a coil tension spring 302 one end of which is affixed to the wall of the part 11.

In the embodiment of the driving train for the separating mechanism shown in FIG. 7, interruption of the work of the separating mechanism is also accomplished by the swinging the part 11 of the spinning unit outwardly as shown in FIG. 7. In such embodiment, however, despite such swinging of part 11 the separating drum 31 remains driven by the disc 30 acting through the belt 300. It will be seen that the spring 302 maintains the tension roll 301 in tight engagement with the

belt in both positions of the part **11**. After returning the movable part into its working position, roller **302** resumes its original position and transfers the rotary motion from disc or pulley **30'** on shaft **20** by means of belt **300** to the drive pulley **32'** of the separating cylinder **31**.

In the above described embodiment of the apparatus, one driving disc **4** drives the pulleys **8** of two opposed spinning units **12**. It is to be understood, however, that within the scope of the invention one driving disc **4** may drive more than two driving pulleys **8**. Thus, with a suitably chosen length of driving belt **5** a various number of spinning chambers **9** may be commonly driven. For example, after driving two opposedly disposed spinning chambers **9**, as in the embodiment described above, the belt may continue along one side of the apparatus in order to drive two neighboring spinning chambers **9** on such side of the apparatus, crossing over to drive one spinning chamber on the other side of the apparatus, and finally driving two opposedly disposed spinning chambers **9** of the apparatus.

It will be understood, that instead of mounting the parts **11** of the spinning units **12** swingably as above shown and described, they may be mounted slideably with respect to the stationary part **9**, **10** of the apparatus.

Although our invention has been illustrated and described with reference to the preferred embodiments thereof, we wish to have it understood that it is in no way limited to the details of such embodiments but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. In an apparatus for the continuous spinning of textile fibers by the open end spinning method, said apparatus having a plurality of spinning units which are driven by a common drive means and which are individually disengageable from said drive means, the improved spinning units which comprise two bodies, one of which is stationary and the other of which is mounted for movement relative thereto between operative and inoperative positions, the outer end of the rotatably driven element being exposed when the movable body is in its inoperative position.

2. Apparatus according to claim **1**, wherein the machine has a frame, each of the spinning units has a spinning chamber, and the spinning chamber is mounted in a stationary body on the machine frame.

3. Apparatus according to claim **1**, wherein each of the spinning units has a separating mechanism and a feeding mechanism associated therewith, and the separating and feeding mechanisms of the spinning units are mounted in the movable one of the two bodies.

4. Apparatus according to claim **3**, wherein the movable body is swingably mounted upon the stationary body.

5. Apparatus according to claim **1**, wherein the spinning chambers are driven by a driving mechanism comprising a main driven shaft extending longitudinally of the apparatus, a driving disc on the main driven shaft in the vicinity of each of the spinning units, the spinning chambers being provided with driving pulleys, and a plurality of driving belts each of which is entrained over a respective one of the driving discs and over at least the driving pulleys of two oppositely disposed spinning chambers.

6. Apparatus according to claim **5**, comprising two stationarily disposed guiding rollers and an adjustable resiliently biased tensioning roller positioned therebetween, the driving belt engaging the guiding and tensioning rollers between its engagement with the driving pulleys of the units on the opposite sides of the apparatus.

7. Apparatus according to claim **1**, comprising means for selectively disengaging the driving belt from the driving pulley of each of the spinning units, said belt-disengaging means comprising a belt-disengaging roller which is interposable between the belt and the driving pulley for said spinning unit.

8. Apparatus as claimed in claim **7**, wherein the belt disengaging roller is mounted upon an arm, and the arm is selectively moved in opposite directions by a control element, said control element being connected to the movable body of the spinning unit, whereby the belt is disengaged from the driving pulley of a spinning unit when the movable body of such unit is moved into inoperative position.

9. Apparatus according to claim **1**, comprising driving means for the separating and feeding mechanisms, said driving means comprising two continuous shafts extending along each side of the apparatus above and below respectively the stationary body of each of the spinning units.

10. Apparatus according to claim **9**, comprising driving trains extending between each of said two longitudinally extending shafts, and a driving train between the respective shafts and the separating mechanism and the feeding mechanism, said driving train being broken upon the moving of the movable body of a spinning unit from its operative to its inoperative position.

11. Apparatus according to claim **10**, wherein both driving trains include serially meshing gears, one gear in each train being journaled on an axis fixed with respect to its driving shaft, another gear, which normally meshes with said first gear, being journaled on the movable body so as to move out of mesh with the one gear when the movable body is moved toward its inoperative position.

12. Apparatus according to claim **9**, wherein at least one of the driving means comprises a pulley on the respective shaft, a pulley on the respective shaft, a pulley journaled on the movable body, a belt entrained over such two pulleys, said belt having an excess length, and a resiliently biased belt-tensioning pulley which pulls the belt into a salient run, whereby the drive through the said driving means continues despite the moving of the movable body into its inoperative position.

* * * * *