April 10, 1951

O. LAMBERT

SPINNING MACHINE

2,548,610

Filed Feb. 24, 1947

3 Sheets-Sheet 1

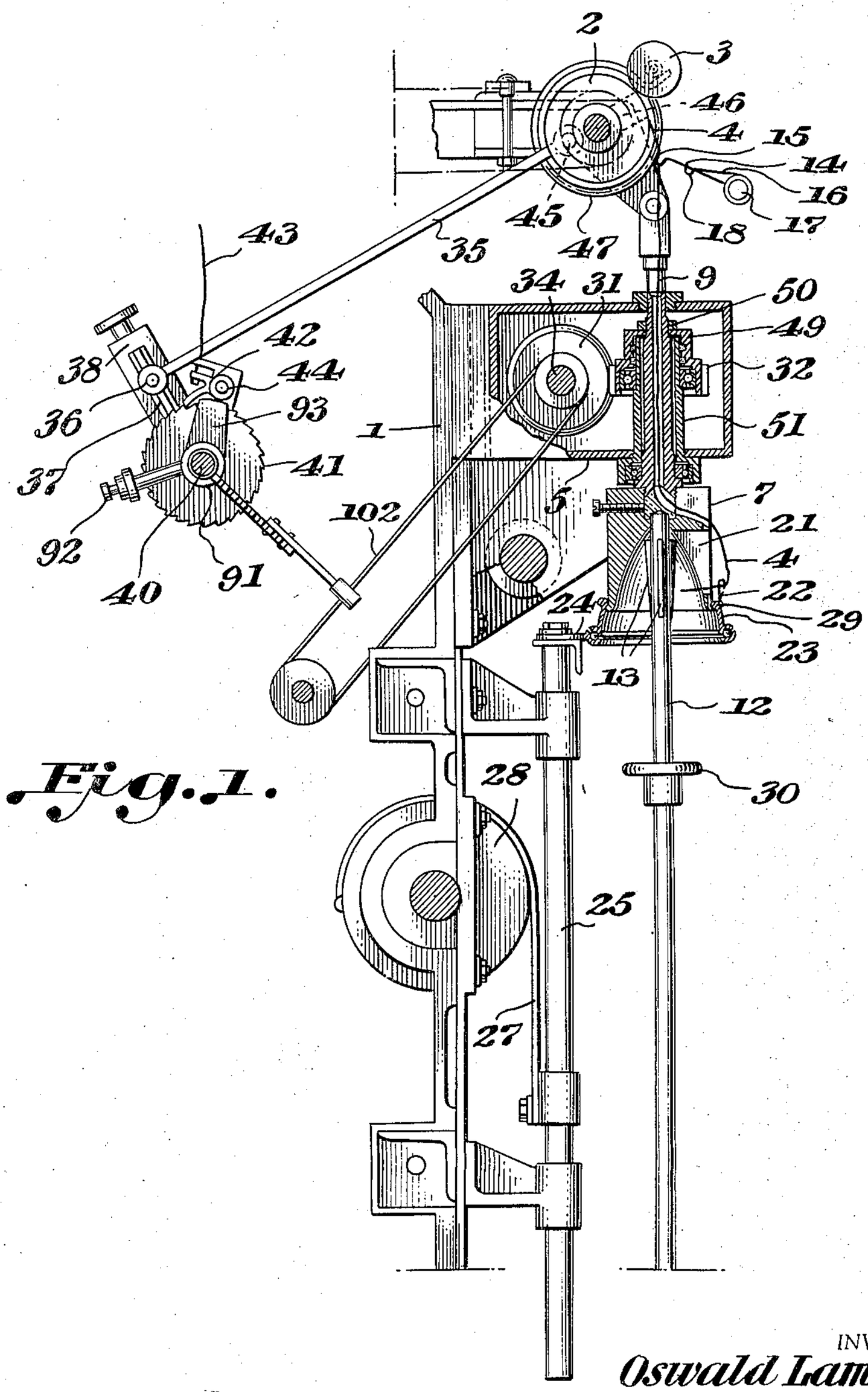

Fig. 1.

INVENTOR

Oswald Lambert,

BY Wenderoth, Lind & Ponack

ATTORNEYS.

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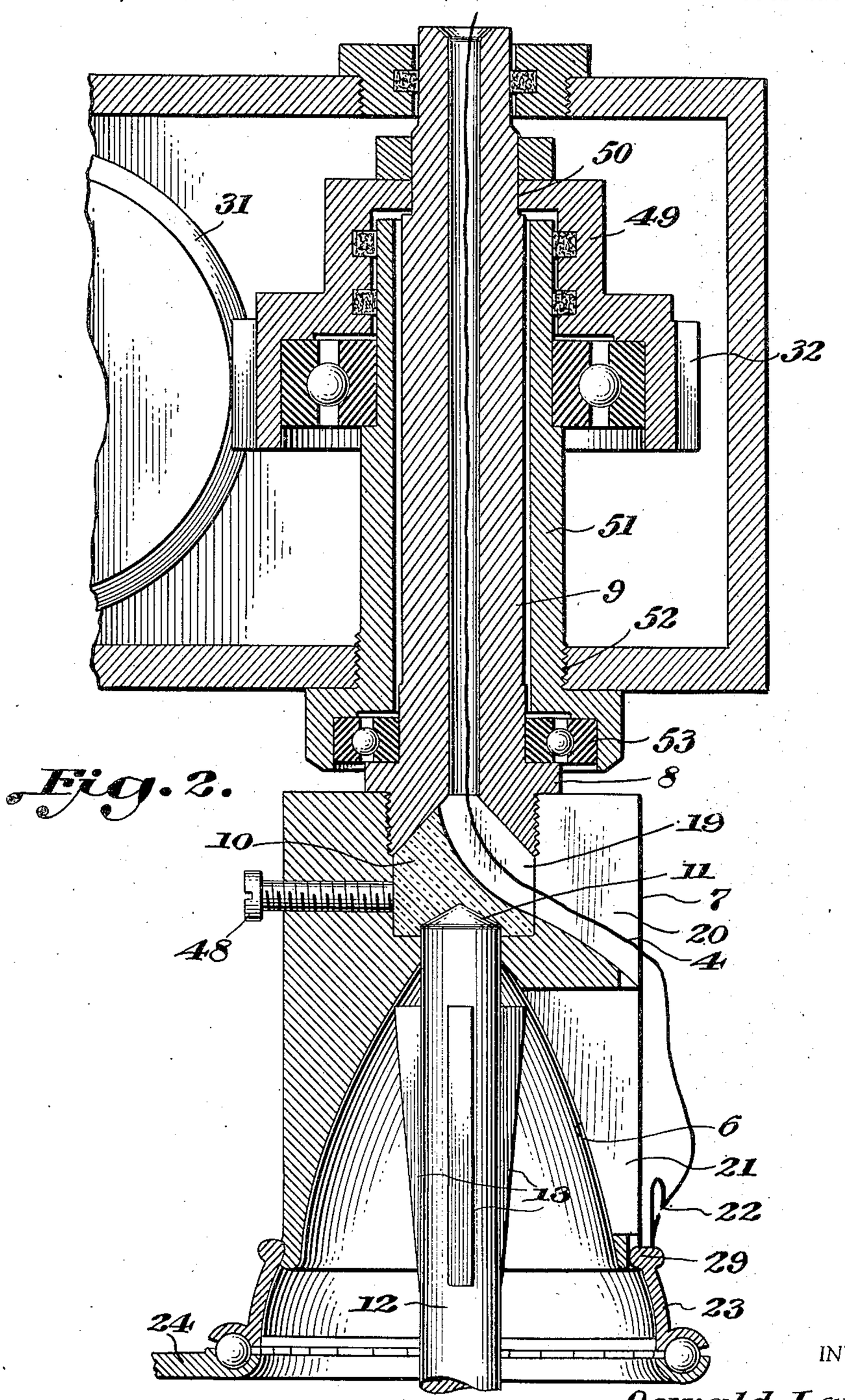

Fig. 2.

INVENTOR

Oswald Lambert,

BY Wenderoth, Lind & Ponack

ATTORNEYS

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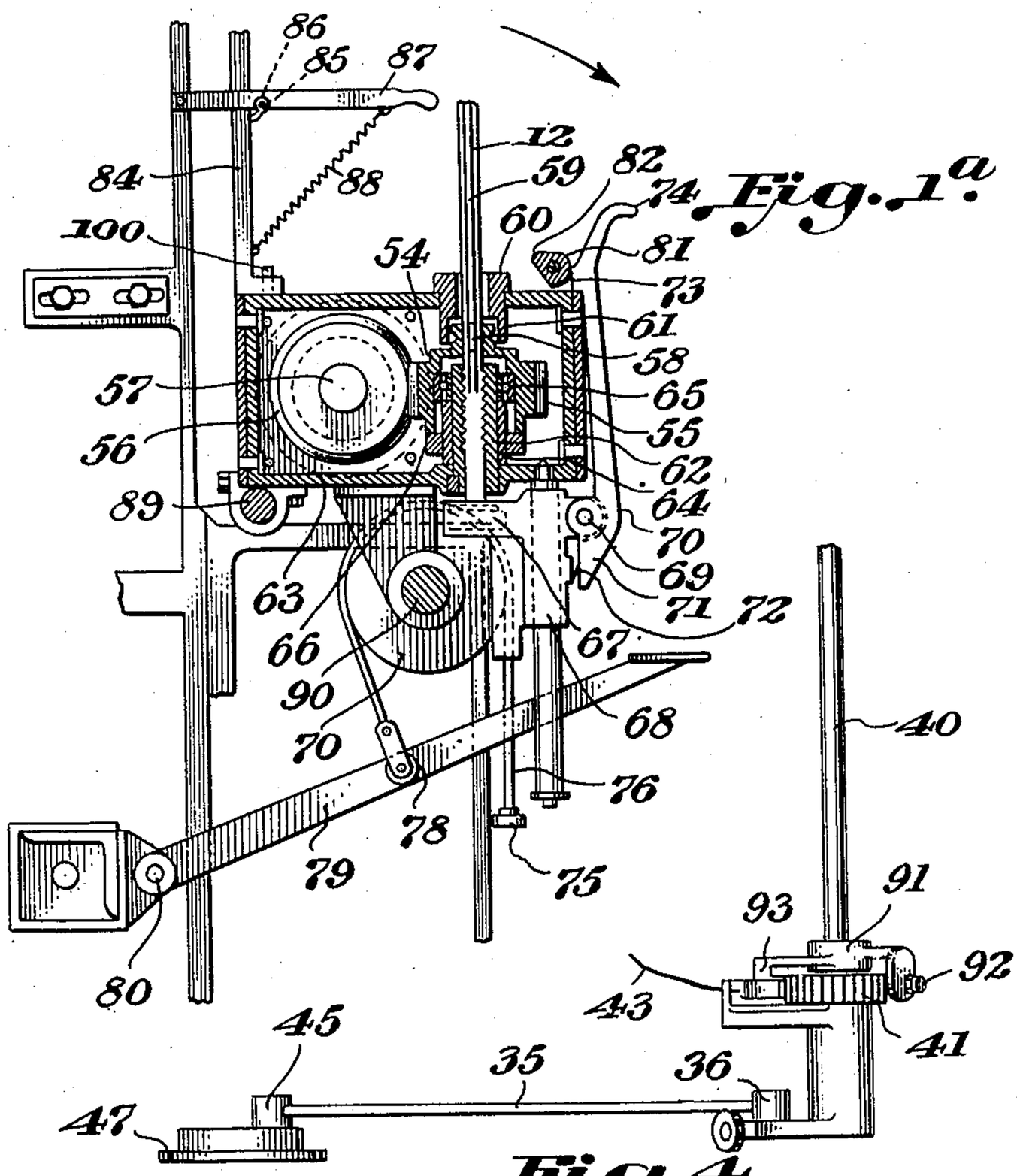

Fig. 1a

Fig. 4.

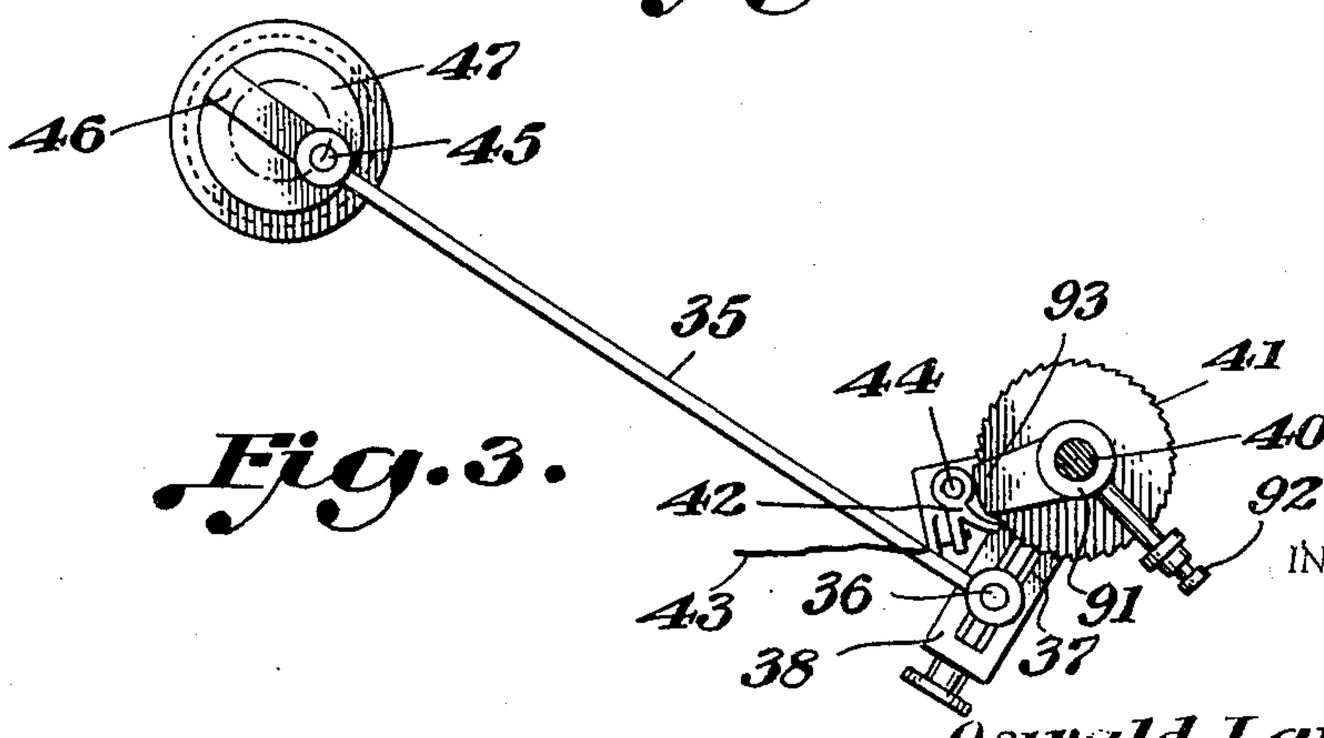

Fig. 3.

INVENTOR

Oswald Lambert,

BY Wenderoth, Lind & Ponack

ATTORNEYS

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SPINNING MACHINE

Oswald Lambert, Tamise, Belgium

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7 Claims. (Cl. 57—67)

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The present invention relates to a spinning machine, in which at least one roving is led from a delivery cylinder to the end of a revolving spindle and is wound on this end against a hollow cone whilst being twisted by means of a thread guide having the shape of an open ring rotatably driven by the hollow cone and having in addition a reciprocating movement in a direction parallel to the axis of the spindle.

Spinning machines of the above type are intended to form cops of thread having a small tractive resistance, such as thread used in the manufacture of blankets, dusters, dish cloths, and the like. In known machines the roving, which has received a preliminary false twist, is wound on to spindles, whilst at the same time the effective twist is imparted to it by means of a hollow cone in the axis of which the spindle rotates and is displaced axially during the formation of the cop. The hollow cone, open at top is placed in rotation and cooperates with a convex cone which is integral with the spindle and of conical shape adapted to the conicity of the hollow cone. The conicity of these two elements leads to the formation of the nose of the cop and to the pressing of the latter to the top progressively as it is formed.

The output of these machines is limited by the fact that great speeds are not practical. In fact, as the cop, the dimensions of which are necessarily considerable by reason of the required thickness of the thread, is formed by a rising movement, the distance between the cylinder supplying the roving and the hollow cone is relatively large, which permits the formation of a "balloon" which, unfortunately, cannot be maintained by the weak resistance of the thread beyond a given norm. The revolving spindle in its ascending movement with the cop in course of being formed, is unsupported, which imposes a limit on the speed and size of the cop.

The object of the present invention is to construct a machine of the kind referred to having a large output and capable of operating at a speed which is clearly greater than that of the machines at present in use, whilst at the same time avoiding the formation of the "balloon" effect.

With this object in view, the machine according to the invention comprises a guide tube the axis of which is coincident with that of the spindle, which revolves without axial displacement independently of the hollow cone, the roving passing from the delivery cylinder into the guide tube, then into the open ring and then passing along the outside of the cone and reaching the above mentioned end of the spindle, the cop being formed by pressing onto the spindle the successive layers of the winding.

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On the other hand, for preventing any increase in friction between the cop in formation and the spindle as the length of the cop increases, the diameter of the surface of revolution generated at the periphery of the rotating spindle decreases along the height of the hollow cone from a maximum existing at the upper part of the spindle to the spindle body diameter.

In a preferred form of construction, at least two vanes are provided on the spindle along a length substantially equal to the height of the hollow cone starting from the above mentioned end of the spindle.

Other features and details of the invention will be apparent from the following description of the accompanying drawings which illustrate, by way of non-limiting example, a particular constructional form of the invention.

Figs. 1 and 1*a* are views in elevation and partly in section of a machine according to the invention. Fig. 2 is a cross sectional view on a larger scale of the control element of the hollow cone of Fig. 1. Figs. 3 and 4 are respectively an elevational and side view of the change speed device.

In the different figures similar reference numerals denote similar parts.

The machine illustrated in the drawings comprises a frame 1 at the upper part of which is mounted a delivery cylinder 2, on which acts a pressure roll 3 and which delivers a roving 4 for forming a cop. A casing 5 of rectangular section is also mounted on the frame 1 and supports a series of hollow cones 6, formed of cylindrical blocks 7 bored interiorly with a conical recess.

Each block 7 is screwed against a shoulder 8 of a guide tube 9, which traverses the casing from one side to the other. A small piece 10 is locked between the block 7 and the shoulder 8 by screwing said block 7 on the shoulder 8. This piece 10 is provided with a conical boring 11 which serves as bearing for a spindle 12 arranged for rotation by a device described hereafter. Three vanes 13 are provided at the upper part of the spindle and extend over a length which is substantially equal to the height of the hollow cone. The transverse dimension of these vanes decreases progressively from the end of the spindle, in such a way that the radius of the surface of revolution generated at the periphery of the spindle by the rotation of the latter, decreases from a maximum down to that of the remainder of the spindle.

The roving 4 leaving the delivery cylinder 2 passes over a tension device formed by a rod 14, terminating in a hook 15 and providing a constant tension on the roving by means of a spring 16 wound around a spindle 17 supporting the rod 14, which pivots around this spindle. The end of the spring 16 is connected at 18 to the rod 14.

The roving then passes into the guide tube 9 and passes out of the block 10 through a radial slit 19, another corresponding radial slit 20 provided in the block 7 providing for the outlet of the roving. The two slits are disposed in alignment and maintained by a locking screw 48. The roving is then led to a guide groove 21, after having passed through a hook 22 mounted on a ring 23, to which is imparted a reciprocating movement parallel to the axis of the spindle (Fig. 1). To this end the ring is supported by a bracket 24 mounted on a post 25, which has a reciprocating movement given by a cable 27 mounted on an oscillating pulley 28. The ring 23 is engaged by a spur 29 in the groove 21 (Figs. 1–2) in such a way that this ring shares the movement of rotation of the hollow cone 6. The rotation of this latter is produced by a helical gear 31 mounted on a shaft 34 and engaging with gearing 32 also helical, provided on a sleeve 49, keyed at 50 on the guide tube 9.

A distance piece 51, screwed at 52 in the casing 5, provided for mounting the different parts. A ball bearing 53 is interposed between the part 51 and the guide tube 9. The shaft 34 is common to all the gears 31 mounted in the casing.

The spindle 12 is placed in rotation near its end opposite the boring 11 by the device illustrated in Fig. 1*a* and housed in a casing 63. This device comprises a sleeve 54 similar to the sleeve 49 and having a helical gear 55 engaging with a helical pinion 56 mounted on a shaft 57. The sleeve 54 drives the spindle through the intermediary of a key 58 engaging in a groove 59 in the spindle 12. A plug 60 provided with a skirt 61 covering the upper part of the sleeve 54, is provided where the spindle 12 emerges from the spindle-carrying casing 63 and prevents any penetration to the spindle of oil contained in the casing. A second fixed sleeve 62 is threaded on the spindle and keyed to the bottom of the casing 63. A distance piece 64 is interposed between the casing and a ball bearing 65 provided between the sleeves 54 and 62. The sleeve 54 has an extension piece 66 which is likewise provided in order to avoid penetration of oil to the spindle.

The lower part of the spindle rests in a thrust bearing 67, provided in a bracket 68 and pivoted at 69 to a lever 70, the lower arm 71 of which is pressed back by a spring 72 bearing on the bracket. The upper arm of the lever 70 may be hooked by a projection 73 on the casing 63. The spindle is thus held in its operative position, that is to say in the position required for the formation of the cop. In this position, the end of the spindle opposite to the end resting in the bearing 67, is engaged in the boring 11 of the block 10. A lip 74 provided on the lever 70 provides for releasing the projection 73 from the casing 63 and for lowering the corresponding bracket 68 at the same time as the spindle 12.

A lifting bar 75 is suspended to one or more cables 76; the bracket 68 when in lowered position rests on this bar 75, which permits of lifting said bracket 68 on lifting said bar by means of

the cable 76. The cable 76 passes over a pulley 77 mounted on a shaft 91 (Fig. 1*a*) and is connected at 78 to a pedal 79 pivoted at 80.

It results from the foregoing that a traction exerted on the lip 74 permits of lowering the spindle, whilst by lowering the end of the pedal 79, the lowered spindle is lifted. Further, bar 81 is provided with a projection 82 which, when said bar 81 rotates on an axis, repulses the lever 70 thus allowing all the spindles to be lowered. When all the spindles are lowered the casing 63 can be caused to pivot in the direction of the arrow 83 (Fig. 1*a*). In this way the spindle which is released from the hollow cone may be easily relieved of the completed cop. In order to provide for the pivotal movement of the casing 63, the latter is hooked in 100 to a lever 84 which carries a projection 85 engaged in a corresponding recess 86 in a pivoting arm 87. A spring 88 tends constantly to return the arm 87 to the projection 85. In order to cause the casing 63 to pivot, the arm 87 is lifted to disengage the projection 85 whereupon there is nothing to oppose the pivoting of the casing around a shaft 89. In order to lift the casing the lever 84 is operated, lifting at the same time the arm 87 in order to permit the projection 85 to penetrate again into the hollow 86 and thus to provide for holding this casing.

After having traversed the hook 22, which provides for the necessary twist of the roving 4, this latter again enters the hollow cone 6 through the groove 21 and is wound onto the end of the spindle 12 placed in rotation by the above described device. The cop starts to form on the vanes 13 so that when, at the end of a given number of to and fro movements of the hook 22, the cop is urged towards the end of the spindle opposite to that which pivots in the boring 11, this cop is disposed on a part of the spindle having an external diameter which is less than the internal diameter of the cop. This renders the friction negligible and, on extension of the cop, prevents any increase in friction, producing breakages of the roving.

A part 30, in the form of a disc, slides frictionally on the spindle 12 and may be placed against the cop which is being formed, on the hollow cone 6, in order to brake the displacement of the cop on the spindle.

During the initial formation of the cop the roving is wound along a profile comprised between the generatrix of the hollow cone and that of the surface of revolution generated by the exterior edge of the vanes.

The twist of the roving depends on the speed of rotation of the spindle, on that of the hollow cone and on the length of roving wound on the spindle during one winding revolution. This latter length varies when starting the formation of the cop, that is to say whilst the winding profile is not merged in with the generatrix of the hollow cone. In order to maintain the twist substantially constant during this period, it is therefore necessary to modify, in consequence, either the speed of the spindle, or that of the cone. In the constructional form illustrated provision is made for increasing the speed of rotation of the latter, at the same time as that of the delivery cylinder 2, but the device described might be applied, without modifications, to the control of the speed of the spindle. During the period in suestion the speed of the delivery cylinder must be reduced, since the length of roving wound during one to and fro

movement of the hook, i. e. in a given time, is smaller than when the winding profile is normal. The variation in speed of the cone is obtained by acting on a change speed device inserted between the control of the gears 31, that is of the shaft 34 on which they are mounted, and the motor. To this end there is provided a link 35 driven by the delivery cylinder 2 as hereinafter described and carrying a crank pin 36, displaceable in a slide 37 of a lever 38, which has therefore an oscillatory movement, around a spindle 39 mounted as an axial extension of a spindle 40 carrying a ratchet wheel 41 (Figs. 3 and 4). The lever 38 is operatively connected to a pawl 42 which engages in the teeth of the ratchet wheel. The spindle 40 of this latter controls, for example, the displacement of a belt 102 on conical pullies, if the speed change device used is of this type. On each revolution of the delivery cylinder, the pawl describes a certain angle and causes the ratchet wheel to turn through a corresponding angle, then it moves backwards, sliding over the teeth of this wheel, and the cycle starts again. It results from this that the speed of the hollow cone increases by a certain amount on each revolution of the delivery cylinder. The variation in speed is not continuous, since, during the return movement of the pawl, this variation is zero, but the solution adopted is perfectly satisfactory in the present case. In order to regulate the displacement of the pawl per revolution of the delivery cylinder, the link 35 carries a crank pin 45 engaging in a groove 46 of a plate 47 keyed to the shaft of the delivery cylinder. By displacing the crank pin 45 in the groove 46, the desired regulation is obtained.

As soon as the period of formation of the starting of the cop is completed, that is to say as soon as the winding profile coincides with the generatrix of the hollow cone, the normal operating speed of the hollow cone is attained. The pawl is then automatically placed out of service. To this end, a part 91 surrounds the shaft 40 and carries a pin 92 engaging in the teeth of the ratchet wheel 41 which permits of keying the part 91 in relation to this wheel, in a predetermined angular position.

This position is selected in such a way that, when the normal operating speed is attained, which corresponds to a given angle of rotation of the ratchet wheel 41, an interposed part formed by a flange 93 on the part 91 is inserted between the teeth and the pawl 42. This latter turns around a pivot 44 and is then placed automatically out of service.

There is also provided a cable 43 which provides for turning the pawl around the pivot 44, when desired. The pin 92 provides for regulating the moment of release of the pawl, whence, all other conditions remaining unchanged, the normal speed of the hollow cone.

It is to be understood that the invention is in no way limited to the constructional form above described and that many modifications may be made, in particular to the shape, the construction, the number and the arrangement of the parts involved in its construction without departing from the scope of the present application for patent, on condition that these changes fall within the scope of the appended claims.

I claim:

1. A spinning machine, comprising a delivery cylinder, a downwardly enlarged hollow cone, means rotating said cone, a spindle, a conical portion on said spindle, the transverse dimension of said conical portion decreasing along the length of said hollow cone progressively from the upper end of the spindle from a maximum down to the spindle body diameter, means for rotating said spindle without axial displacement independently of said hollow cone, a guide tube having its axis coinciding with that of said spindle, a thread guide, means for rotatably driving said guide by said cone, and means imparting to said guide an up and down movement parallel to the axis of said spindle.

2. A spinning machine, comprising a delivery cylinder, a downwardly enlarged hollow cone, means rotating said cone, a spindle provided with vanes of which the overall transverse dimension decreases along the length of said hollow cone progressively from the upper end of the spindle from a maximum down to that of the spindle body diameter, means for rotating said spindle without axial displacement independently of said hollow cone, a guide tube having its axis coinciding with that of said spindle, a thread guide, means for rotatably driving said guide by said cone, and means imparting to said guide an up and down movement parallel to the axis of said spindle.

3. A spinning machine, comprising a delivery cylinder, a hollow downwardly enlarged cone, means rotating said cone, a spindle, means rotating said spindle without axial displacement independently of said hollow cone, a guide tube having its axis coinciding with that of said spindle, a thread guide, means for rotatably driving said guide by said cone, means giving to said guide an up and down movement parallel to the axis of said spindle, a change speed device controlling the rotation of said hollow cone, and providing for increasing the speed of rotation of said cone at the starting period of the winding, an element actuated by said delivery cylinder for controlling said change speed device, and means for placing out of action said element when the speed of rotation of said hollow cone is substantially equal to its normal operating speed.

4. A spinning machine comprising a delivery cylinder, a hollow downwardly enlarged cone, means rotating said cone, a spindle, means for rotating said spindle without axial displacement independently of said hollow cone, a guide tube having its axis coinciding with that of said spindle, a thread guide, means for rotatably driving said guide by said cone, means giving to said guide an up and down movement parallel to the axis of said spindle, a change speed device controlling the rotation of said hollow cone, and increasing the speed of rotation of said cone at the starting period of the winding, means for reducing the speed of said delivery cylinder during said starting period of the winding, an element actuated by said delivery cylinder for controlling said change speed device, and means for placing out of action said element when the speed of rotation of said hollow cone is substantially equal to its normal operating speed.

5. A spinning machine, comprising a delivery cylinder, a hollow downwardly enlarged cone, means rotating said cone, a spindle, means for rotating said spindle without axial displacement independently of said hollow cone, a guide tube having its axis coinciding with that of said spindle, a thread guide, means for rotatably driving said guide by said cone, means impart-

ing to said guide an up and down movement parallel to the axis of said spindle, a change speed device controlling the rotation of said hollow cone, means for controlling said change speed device, said controlling means comprising a ratchet wheel, a pawl engaging with said ratchet wheel, a rod for oscillating said pawl, and a crank joined to said rod and rotating with said delivery cylinder.

6. A spinning machine comprising a delivery cylinder, a hollow downwardly enlarged cone, means rotating said cone, a spindle, means rotating said spindle without axial displacement independently of said hollow cone, a guide tube having its axis coinciding with that of said spindle, a thread guide, means for rotatably driving said guide by said cone, means imparting to said guide an up and down movement parallel to the axis of said spindle, a change speed device controlling the rotation of said hollow cone, means for controlling said change speed device, said controlling means comprising a ratchet wheel, a pawl engaging with said ratchet wheel, a pivot on which said pawl is mounted, a rod for oscillating said pawl, a crank joined to said rod and rotating with said delivery cylinder, and means for placing out of action said controlling means when the speed of rotation is substantially equal to its normal operating speed, said last named means being constituted by an interposed part inserted between said pawl and said ratchet wheel, said part being fixed on said wheel in a predetermined angular position, selected in such a way that said part brings said pawl out of operation at the time when said wheel has itself reached the angular position corresponding to the normal operating speed.

7. A spinning machine comprising a delivery cylinder, a hollow downwardly enlarged cone, means rotating said cone, a spindle, means to rotate said spindle without axial displacement independently of said hollow cone, a guide tube

having its axis coinciding with that of said spindle, a thread guide, means for rotatably driving said guide by said cone, means imparting to said guide an up and down movement parallel to the axis of said spindle, a change speed device controlling the rotation of said spindle, means for controlling said change speed device, said controlling means comprising a ratchet wheel, a pawl engaging with said ratchet wheel, a pivot on which said pawl is mounted, a rod for oscillating said pawl, a crank joined to said rod and rotating with said delivery cylinder, and means for placing out of action said controlling means when the speed of rotation is substantially equal to its normal operating speed, said last named means being constituted by an interposed part inserted between said pawl and said ratchet wheel, said part being fixed on said wheel in a predetermined angular position, selected in such a way that said part brings said pawl out of operation at the time when said wheel has itself reached the angular position corresponding to the normal operating speed.

O. LAMBERT.

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