March 4, 1952 J. L. PELLAT-FINET ET AL 2,587,758

TWISTING SPINDLE

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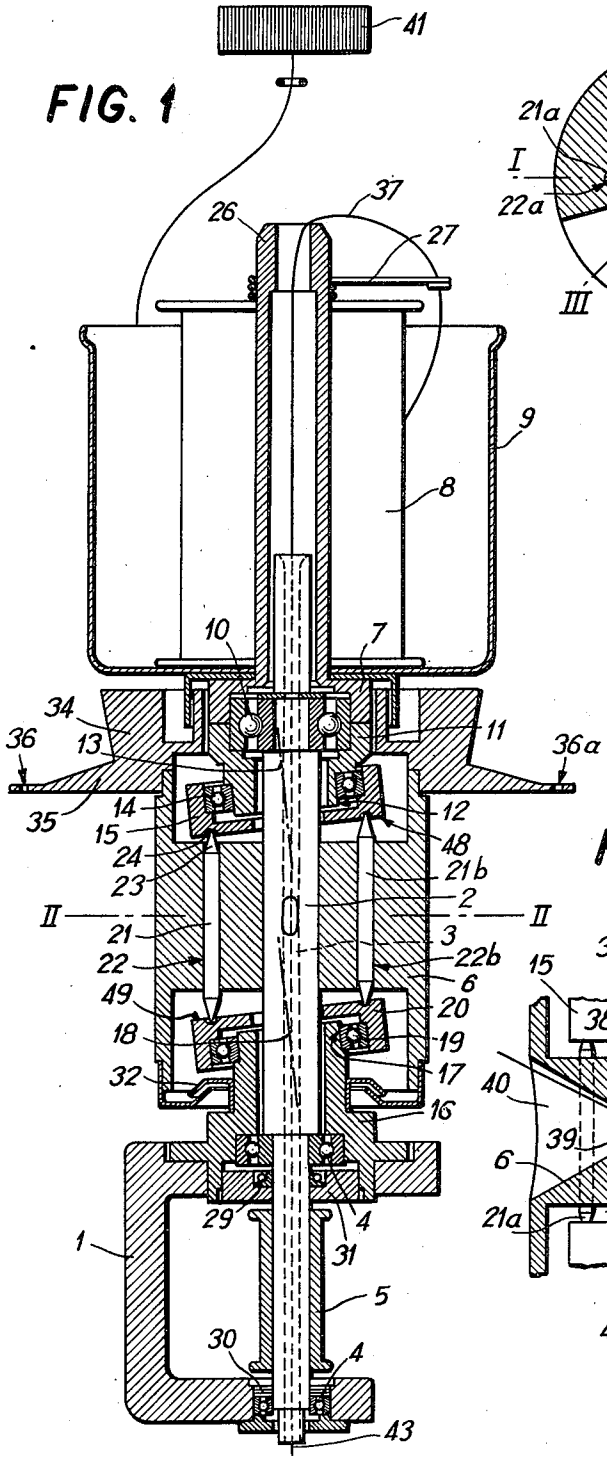
FIG. 1



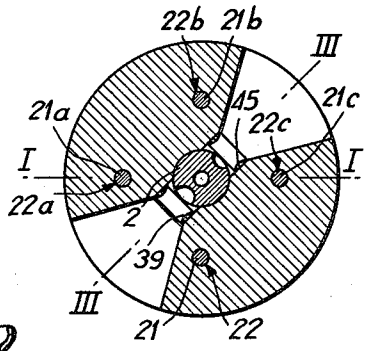
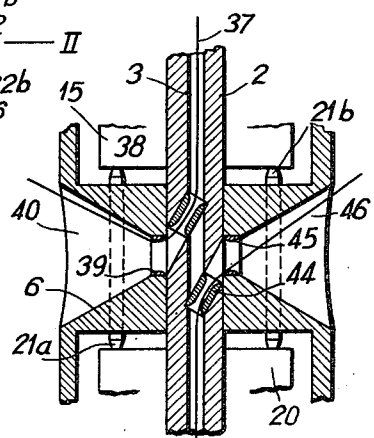


FIG. 2

FIG. 3



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TWISTING SPINDLE

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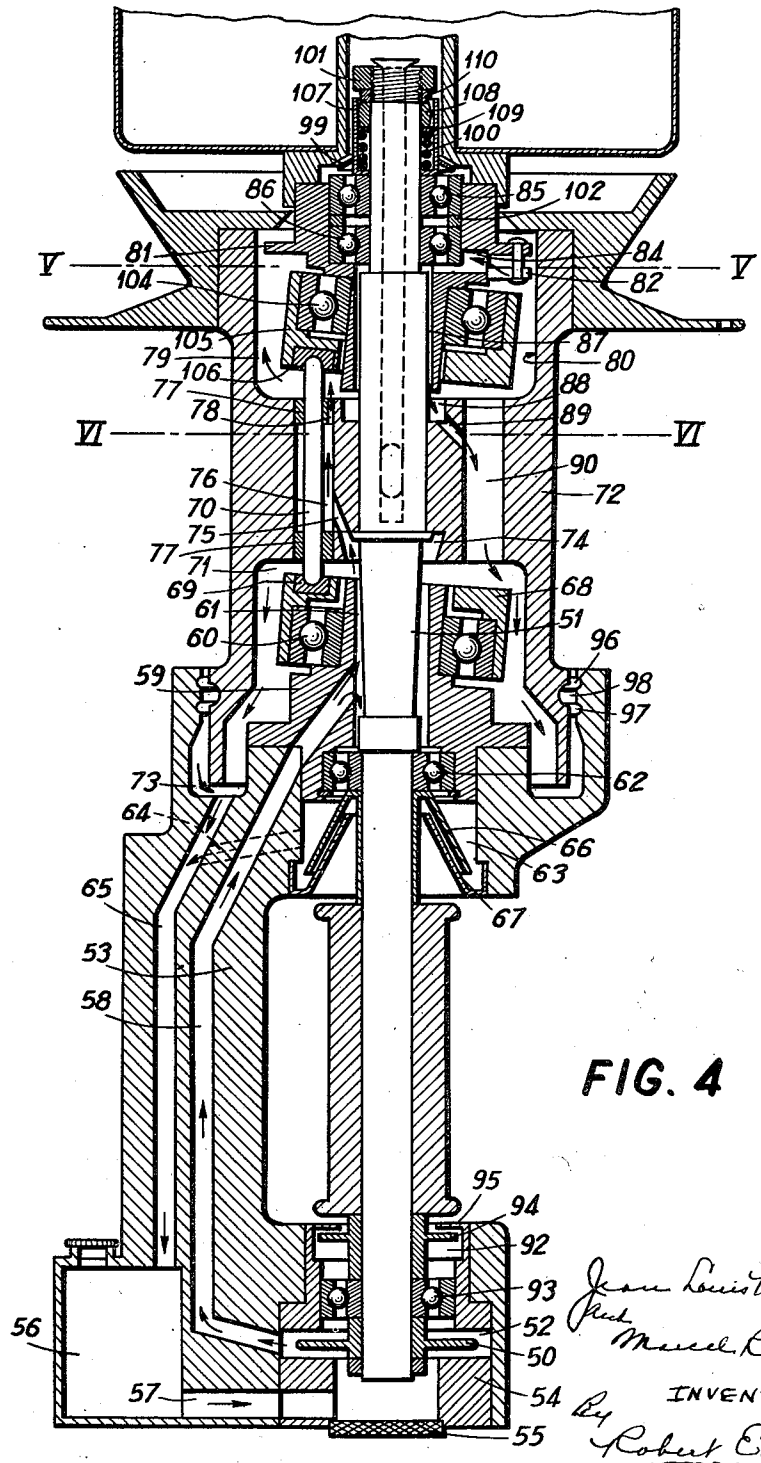

FIG. 4

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FIG. 5

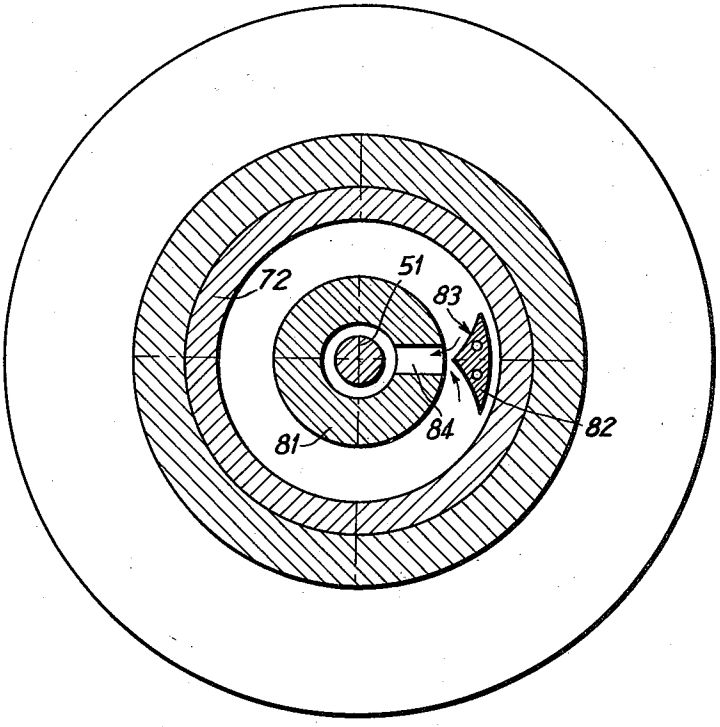
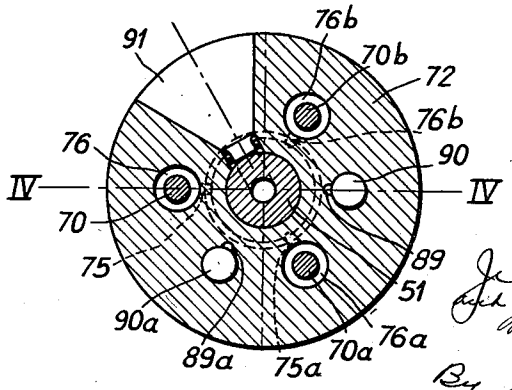


FIG. 6



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Patented Mar. 4, 1952 2,587,758

UNITED STATES PATENT OFFICE

2,587,758

TWISTING SPINDLE

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Application January 18, 1949, Serial No. 71,448
In France May 14, 1948

6 Claims. (Cl. 57—58)

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This invention relates to a twisting spindle comprising a hollow central shaft and a support for the supply of the thread.

The spindle according to the invention consists of: two sleeves concentric with the hollow shaft and provided with cylindrical shoulders having inclined axes with respect to the axis of the shaft, one of the sleeves being in rigid connection with the support of the thread; two annular members rotatably mounted on the said cylindrical shoulders and connecting members capable of maintaining the two annular members in two parallel planes; the whole arrangement being such that when one of the sleeves is kept fixed the other one will also be kept fixed, the thread support being thus maintained fixed, and the twist of the thread being double.

The accompanying drawings illustrate by way of example two forms of construction according to the invention.

Figure 1 is an axial section of the first form of construction of a spindle taken along the line I—I in Figure 2;

Figure 2 is a transverse section taken along the line II—II in Figure 1;

Figure 3 is a longitudinal section taken along the line III—III in Figure 2;

Figure 4 is an axial section of the second form of construction of the spindle taken along the line IV—IV in Figure 6;

Figure 5 is a transverse section taken along the line V—V in Figure 4, and

Figure 6 is a transverse section taken along the line VI—VI in Figure 4.

Referring to the first form of construction, 1 is a stationary frame or rail supporting the spindle, 2 is a shaft provided with a bore 3 and rotatably mounted on the said frame through the intermediary of two ball-bearings 4. A pulley 5 serves for the rotation of the shaft 2, the latter rotating a casing 6. A sleeve or the like 7 supports the supply of the thread which is carried by a spool 8. The thread may be carried by a bobbin or in the form of a cheese. The sleeve 7 is supported by the shaft 2 through the intermediary of a ball-bearing 10; this sleeve further carries a cup-shaped member 9.

The sleeve 7 and consequently also the spool 8 and the cup-shaped member 9 are fixed to a sleeve 11, the latter being formed with a cylindrical lower extension 12, the geometrical axis 13 of which is inclined relatively to the axis of the shaft 2. A ball-bearing 14 is mounted on the sleeve extension 12 and on the outer ring of the said bearing there is mounted an annular

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member 15, the latter thus being able to turn around the inclined axis 13.

The spindle rail 1 supports a sleeve 16 which is fixed thereto and is formed with an upper cylindrical extension 17, the geometrical axis 18 of which is parallel to the axis 13. On the sleeve extension 17 there is mounted a ball-bearing 19 on the outer ring of which there is mounted an annular member 20 which is consequently compelled to turn around the axis 18.

The members 15 and 20 are coupled by pins 21, 21*a*, 21*b* and 21*c* capable of sliding in holes 22, 22*a*, 22*b* and 22*c* provided in the casing 6. Any suitable number of pins may be used four being shown. The ends 23 of the pins are conically shaped and engage in recesses 24 provided in the annular members 15 and 20.

The bobbin holder 7 is provided at its upper part with a ferrule 26; a wire flyer 27 is rotatably mounted on the spindle in order to facilitate the lifting of the thread when the spool 8 is unwound. Packings 29 and 30 effect a tight joint for the lubricant and a nut 31 keeps the ball-bearings in position.

A lid 32 forming a baffle prevents the lubricant from escaping from the casing 6 which is closed at its upper end by a cover 34. The latter is provided with a flange 35 provided with holes 36 and 36*a*. The thread 37 coming from the spool 8 enters into the upper end of the spindle after having passed through an eyelet in the wire flyer 27 and leaves the bore 3 in the axis of the shaft 2, passing through a tubular member 38, an eyelet 39 and an opening 40 in the casing 6. The thread then passes on to a winding-on spool 41 after having been led through a hole 36 provided in the flange 35.

A second thread 43 (Figure 3) may enter through the lower end of the bore 3 and go to the winding-on spool by passing through a tubular member 44, an eyelet 45 and an opening 46 in the casing 6 in such a manner that it becomes assembled with the thread coming from the spool 8.

The operation is as follows:

The casing 6 rotating together with the shaft 2 takes along with it the pins 21, 21*a*, 21*b* and 21*c* which in their turn take along the members 15 and 20 each around its own axis 13 and 18 respectively in such a manner that their faces opposite each other, 48 and 49 constantly remain parallel to each other. The parallelism is due to the fact that several points of these two surfaces are compelled to remain at the same distance, the length of the pins remaining con-

stant. Since the surfaces 48 and 49 remain parallel to each other it also follows that their axes 13 and 18 at right angles thereto also remain constantly parallel to each other.

The axis 18 being fixed in space owing to the fact that the sleeve 16 is fixed to the frame 1 it follows that the sleeve 11 cannot turn around the shaft 2; any rotation of the sleeve 11 would destroy the parallelism of the axes 13 and 18, which the arrangement of the pins and of the members 15 and 20 renders impossible. The sleeve 11 being stationary, the bobbin holder 7, the cup-shaped member 9 and the spool 8 which are fixed thereto remain also stationary during rotation of the spindle. Owing to the immobility of the feeding spool 8, the thread is given a double twist.

The mounting of the pins 21, 21*a*, 21*b* and 21*c* in the sockets 24 may be adapted to absorb the centrifugal forces to which the pins are subjected. The bores 22, 22*a*, 22*b* and 22*c* are slightly greater than the pins so as to allow slight radial displacements of the pins 21, 21*a*, 21*b* and 21*c* which are due to the inclination of the members 15 and 20, whilst still ensuring a proper guidance.

Referring to the second form of construction shown in the Figures 4 to 6 the spindle includes a circulating pump for the lubricant constituted by a disc 50 mounted on the shaft 51 and acting like a centrifugal turbine. This turbine rotates in a cavity 52 provided at the lower end of the frame 53. At its lower end the cavity 52 is closed by a member 52 and a stopper 55.

The turbine 50 receives the oil contained in a reservoir 56 provided in the frame 53. The oil is delivered by the turbine 50 through a duct 58 provided in the frame 53 and provided in a sleeve 59 which carries an inclined ball-bearing 60. It thus moves in an annular space 61 between the shaft 51 and the inner bore of the sleeve 59. A portion of the oil descends along the shaft and after having oiled a ball-bearing 62 it arrives in a cavity 63 from which it returns to the reservoir 56 through ducts 64 and 65. A rotary deflector 66 and a fixed one 67 prevent the oil from escaping along the shaft, the orifice of the duct 64 being at a lower level than that of the top end of the deflector 67. Another portion of the oil forced into the annular space 61 ascends along the shaft. A certain amount of this oil follows the surface of an annular member 68 in which there are mounted bushes 69 for the ends of the pins 70, 70*a* and 70*b*. The oil lubricates these bushes and is then thrown by the rotation into a cavity 71 of the rotary casing 72 which is driven by the shaft 51. It then drops into a channel 73 provided in the upper part of the frame 53 whence it returns through the duct 65 to the reservoir 56. Another portion of the oil is thrown at the outlet of the annular space 61 into a cavity 74 provided in a rotary casing 72. The centrifugal force together with the inclination of the walls of the cavity 74 compels the oil to pass through channels 75, 75*a* and 75*b*, which lead it to the central part of the orifices 76, 76*a* and 76*b*, through which pass pins 70, 70*a* and 70*b*. These orifices are provided at their upper and lower ends with bushes 77 in which the pins slide, the bushes being thereby oiled. The upper bushes are provided with orifices 78 which allow the excess of oil to be thrown into the upper cavity 79 of the rotary casing 72 to escape. Owing to the centrifugal force this oil is concentrated along the vertical walls 80 of the casing 72 and is rotatably taken along after having lubricated the upper bushes of the needles.

A sleeve 81 surrounds the shaft 51 and is held in fixed position by a set of pins and bearings. A baffle 82 is carried by the sleeve 81 and is disposed a short distance from the wall of the casing 72. During rotation of the spindle, the baffle 82 is held in fixed position by the fixed sleeve 81. The baffle 82 is provided with a chamfered surface 83, which collects the rotating oil and guides the oil toward a channel 84 provided in the sleeve 81. The baffle 82 is symmetrical so as to act irrsepective of the rotation of the casing. The channel 84 leads the oil to the proximity of the upper part of the shaft 51, so as to lubricate the bearings 85 and 86 supporting the upper sleeve 81. The excess oil then drops along the shaft 51 into an annular space 87 between the sleeve 81 and the shaft 51 and penetrates into the cavity 88 provided on the upper surface of the casing 72. From this point it is led by channels 89, 89*a* and orifices 90 and 90*a* to the lower part 71 of the casing 72, then dropping into the channel 73 and returning through the channel 65 to the reservoir 56.

The circulation is continuous during the rotation of the spindle and is automatically regulated since the output of the turbine 50 is a function of the speed and the power consumed is very small.

The orifices 90, 98 provided in the casing 72 may serve to balance the casing by compensating for the outlet opening 91 of the thread.

The maximum level of the oil in the reservoir 56 is such that the oil cannot get out through the upper part 92 of the ball-bearing 93. A rotary deflector 94 and a fixed one 95 prevent the escape of oil particles.

Grooves 96 and 97 provided in the upper opening of the frame and 98 provided in the lower portion of the casing likewise prevent the escape of oil and ensure a tight joint without introducing detrimental frictions. A rotary conical deflector 99 prevents the thrown-off oil from escaping at the upper part of its trajectory.

Moreover, the spindle comprises a regulating and damping device which facilitates the mounting and compensates for the wear of the pins.

For this purpose the bearings 85 and 86 are slidingly mounted on the shaft 51. They are pressed downwards by a spring 100 rotating with the shaft 51 and bearing on a nut 101 screwed on this shaft. The bearings 85 and 86 spaced by a washer 102 cause the assembly of sleeve 81, inclined roller bearing 104 and an annular member 105 supporting the upper bushes 106 of the pins to be supported on the upper part of the pins 70, 70*a* and 70*b*. The resilient pressure provided by the spring 100 facilitates the regulation taking up the play due to the wear of the bushes and pins. It is to be understood that the ball-bearings 85 and 86 may be replaced by a single bearing.

The spring 100 is placed in a cup 107 turning therewith. Between the spring 100 and the nut 101 there is placed a rubber ring 108 which is gripped between two washers 109 and 110. This ring rubs against the interior wall of the cup 107 thereby braking the vertical oscillations of the cup which it damps.

What we claim is:

1. A twisting spindle comprising a hollow central shaft for the inward passage of the thread, means for rotating said shaft, a fixed tubular member and a rotatable one arranged concentrically with said hollow shaft in spaced relation with one another, a support for a supply of thread secured to said rotatable tubular member, each

of said tubular members being formed with a cylindrical seat each having an inclined axis with respect to the axis of said shaft and the axes of said cylindrical seats being parallel, an annular member rotatably mounted on each of said inclined cylindrical seats, and connecting members between said two annular members for constantly holding them in two parallel planes, oblique to the axis of said shaft, whereby the rotatable tubular member is obliged to keep its axis stationary, that is to say to remain stationary as well as the thread support secured to it, the thread being thus given a double twist.

2. In a twisting spindle as claimed in claim 1, an oil reservoir, a pump driven by said hollow shaft for feeding oil from said reservoir into the parts to be lubricated, duct means through which the oil is conveyed from said pump to said parts, and means for effecting a tight joint for the oil, without friction between the rotary and the stationary elements of the spindle, said means comprising stationary and rotary deflectors.

3. In a twisting spindle as claimed in claim 1, an oil reservoir, a rotary disc driven by said hollow shaft for feeding oil from said reservoir into the parts to be lubricated, and duct means through which the oil is conveyed from said disc to said parts, some portions of said duct means being oblique to the axis of rotation of the spindle.

4. In a twisting spindle as claimed in claim 1, an oil reservoir, a rotary disc driven by said hollow shaft for feeding oil from said reservoir into the parts to be lubricated, duct means through which the oil is conveyed from said disc to said parts, some portions of said duct means being oblique to the axis of rotation of the spindle, and a baffle situated substantially at the top of the hollow shaft within said duct means, for bringing the oil from the periphery of the spindle back towards the shaft thereby to allow centrifugal force to circulate it again.

5. A twisting spindle comprising a hollow central shaft for the inward passage of the thread, means for rotating said shaft, a fixed tubular member and a rotatable one arranged concentrically with said hollow shaft in spaced relation with one another, a support for a supply of thread secured to said rotatable tubular member, each of said tubular members being formed with a cylindrical seat each having an inclined axis with respect to the axis of said shaft and the axes of said cylindrical seats being parallel an annular member rotatably mounted on each of said cylindrical seats, sockets provided in said annular members, and a set of pins having their ends journalled in said sockets and arranged parallel to the axis of the hollow shaft between said two annular members for constantly holding them in two parallel planes, oblique to the axis of said shaft, whereby the rotatable tubular member is obliged to remain stationary as well as the thread support secured to it, the thread being thus given a double twist.

6. In a twisting spindle as claimed in claim 5, a rotary casing secured to the hollow shaft and bores provided in said casing parallel to the axis of said shaft and in which said pins are slidingly mounted.

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