F. H. SLEEPER.

WIRE COILING MACHINE.

APPLICATION FILED DEC. 26, 1916.

1,314,909.

Patented Sept. 2, 1919.

2 SHEETS—SHEET 1.

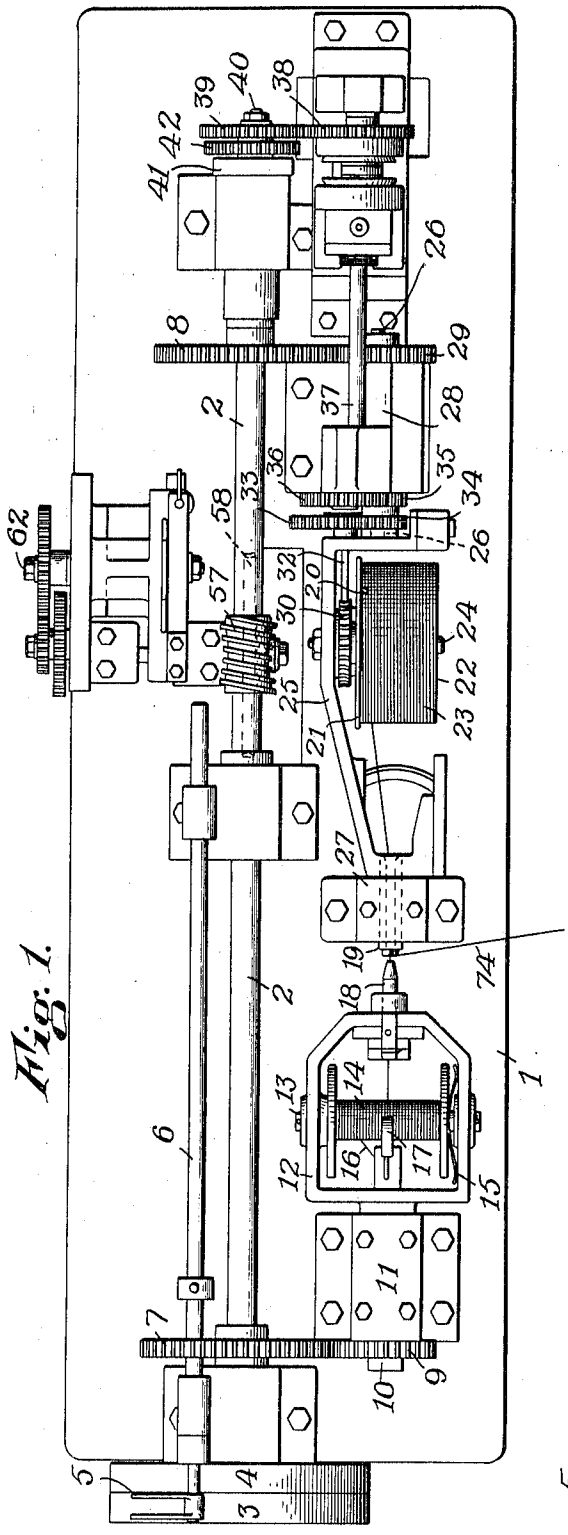


Fig. 1.

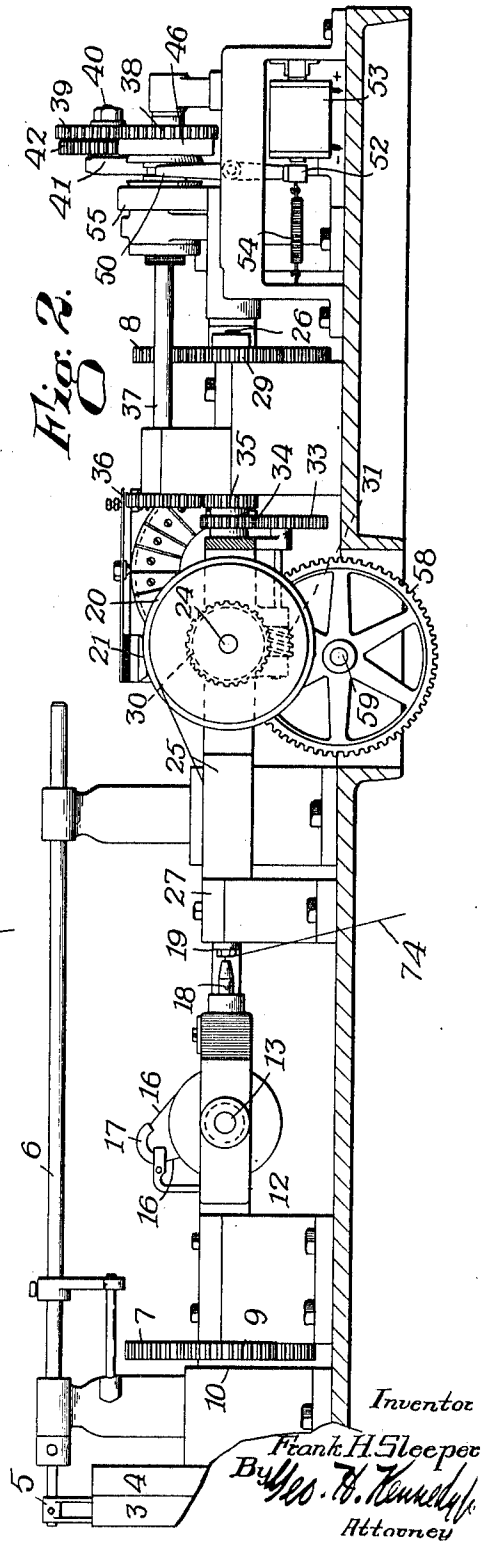


Fig. 2.

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Fig. 3.

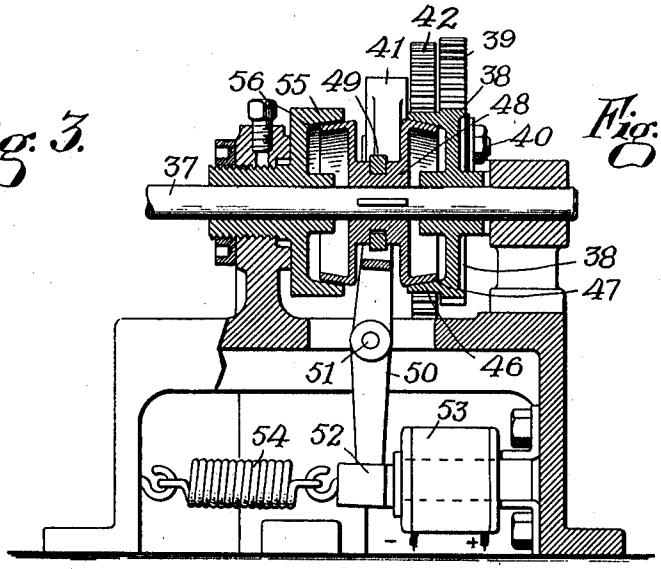


Fig. 7.

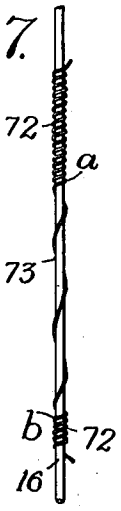


Fig. 6.

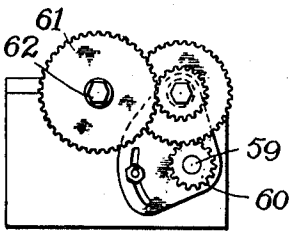


Fig. 5

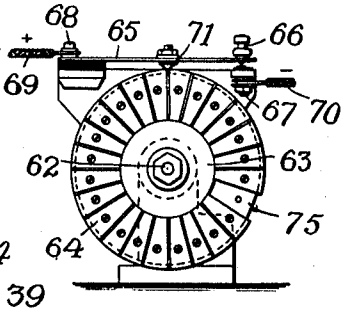
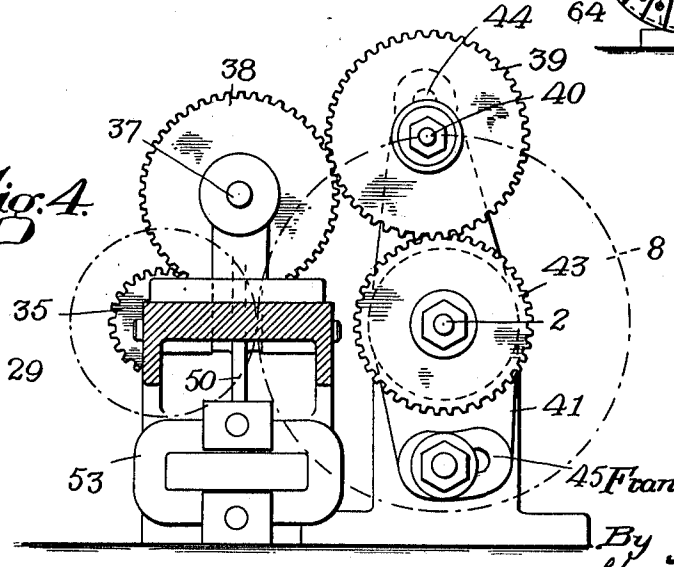


Fig. 4.



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UNITED STATES PATENT OFFICE.

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WIRE-COILING MACHINE.

1,314,909. Specification of Letters Patent. Patented Sept. 2, 1919.

Application filed December 26, 1916. Serial No. 138,712.

To all whom it may concern:

Be it known that I, FRANK H. SLEEPER, a citizen of the Dominion of Canada, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, United States of America, have invented a new and useful Improvement in Wire-Coiling Machines, of which the following is a specification, accompanied by drawings forming a part of the same.

The particular object of the machine forming the subject of the present application is to produce a coiled tungsten filament adapted for use in incandescent electric lamps. A second object is to provide means for producing the coiled filaments in separate groups, and also for varying the spacing between the groups of coils. These objects, among others, I accomplish by the construction and arrangement of mechanism as hereinafter described and illustrated in the accompanying drawings, in which—

Figure 1 represents a plan view of a coiling machine embodying my present invention.

Fig. 2 is a side view.

Fig. 3 is a vertical sectional view through the clutching mechanism, the section being taken on the plane of the broken line 3—3, Fig. 1.

Fig. 4 is an end view showing the change gear for varying the pitch of the coiled filaments.

Fig. 5 is a front detached view of the cam for controlling the spacing between each group of coiled filaments.

Fig. 6 is a rear view of the change gear for rotating the cam shown in Fig. 5.

Fig. 7 is an enlarged view of the coiled filament and showing the spacing between two groups of coiled filaments.

Similar reference characters refer to similar parts in the different figures.

Referring to the accompanying drawings, 1 denotes a base plate upon which the operative mechanism of the machine is mounted. Supported in suitable bearings held on the base plate 1 is a countershaft 2 carrying upon one end the tight and loose pulleys 3 and 4 and driven by any suitable motive power, in the present instance by a belt connection with a main driving shaft controlled by a shipper fork 5 carried upon a sliding hand rod 6. Carried upon the countershaft 2 are gears 7 and 8. The gear 7 engages a gear 9 carried upon one end of a short shaft 10 journaled in a bearing 11. The opposite end of the shaft 10 carries a frame 12 in which is held a spindle 13 at right angles to the axis of the shaft 10. Upon the spindle 13 is loosely mounted a spool 14 adapted to carry a small steel wire to form a core around which the tungsten filament is coiled. The spool 14 is frictionally held from too free rotation by its contact with a bent spring 15 having its ends resting against the side of the frame 12. The wire 16 carried upon the spool 14 is conducted through a bent friction tube 17 to a hardened steel bushing 18 having its axis coincident with the axis of the shaft 10.

The wire 16 forming the core is conducted to the bushing 18 through a hollow spindle 19 and attached to a stud 20 in the flange 21 of a winding drum 22, provided with a spiral groove 23 on its periphery in which the coiled filament is laid as the drum 22 revolves. The winding drum 22 is carried upon a stud 24 held in a revolving flier frame 25, attached at one end to the hollow spindle 19, and at the opposite end to a shaft 26. The flier frame 25 is journaled in a bearing 27 for the hollow spindle 19 and a bearing 28 for the shaft 26. Attached to the end of the shaft 26 is a gear 29 in mesh with the gear 8 carried upon the countershaft 2. The frames 12 and 25 revolve about coincident axes and are driven at the same speed by the gears 7 and 9 and the gears 8 and 29, by which a rotative movement is given to the core wire 16 as it passes from the spool 14 to the winding drum 22. The stud 24 carries a worm gear 30 engaging a worm 31 carried upon a spindle 32 journaled in the flier frame 25, and carrying upon its end a gear 33. The gear 33 engages a gear 34 turning loosely on the shaft 26. Attached to the hub of the gear 34 is a gear 35 which is engaged by a gear 36 carried upon the end of a shaft 37. Turning loosely upon the opposite end of the shaft 37 is a gear 38 in mesh with a gear 39 rotating loosely upon a stud 40 carried upon the upper end of a two-armed lever 41 journaled upon the countershaft 2.

Carried upon the hub of the gear 39 is a gear 42 which is driven by a gear 43 attached to the end of the countershaft 2. The two-armed lever 41 is provided with a radial slot 44 at its upper end and a curved slot 45 at

its lower end concentric with the axis of the shaft 2. The slot 45 permits the adjustment of the two-armed lever about the axis of the countershaft 2, and the slot 44 permits the adjustment of the stud 40 in order to enable the gears to be changed for the purpose of varying the speed of the gear 38 on the shaft 37. The gear 38 is provided on one side with a flange 46 having an interior beveled surface fitting a beveled flange 47 carried upon a slidable clutching member 48 having a spline connection with the shaft 37 and operated by a shipping ring 49 pivotally connected in the upper end of a lever 50 pivoted to the framework at 51 and carrying at its lower end an armature 52 within the field of an electromagnet 53. The armature 52 is drawn away from the magnet 53 by a spiral pull spring 54 connected at one end to the armature 52, and at the opposite end to the framework of the machine. The tension of the spring 54 serves to hold the flange 47 normally in contact with the flange 46 upon the gear 38 and thereby cause the rotation of the gear 38 to be imparted to the shaft 37. Supported by one of the journal bearings of the shaft 37 is a fixed flange 55 having an interior beveled surface similar to the flange 46 and adapted to be engaged by a beveled flange 56 carried upon the clutching member 48.

In the position of the clutching mechanism, shown in sectional view in Fig. 3, the shaft 37 is rotated by the clutching mechanism from the countershaft 2 through the intermediate gearing shown in Fig. 4. When the electromagnet 53 becomes energized, as hereinafter described, the armature 52 is drawn toward the magnet against the tension of the spring 54, thereby rocking the lever 50 and disengaging the clutching member from the driving gear 38 and carrying the flange 56 into frictional engagement with the fixed flange 55, thereby stopping the rotation of the shaft 37.

The countershaft 2 carries a worm 57 engaging a worm gear 58 on a transverse shaft 59. The shaft 59 carries a pinion 60, which, through a system of change gears drives a gear 61 on a shaft 62. The shaft 62 carries a disk wheel 63 upon which a series of plates 64 are attached. The plates 64 lie side by side and project slightly beyond the periphery of the disk wheel 63 with their outer ends forming a circle concentric with the shaft 62.

Supported upon the framework immediately over the disk wheel 63 is an insulated elastic blade 65 carrying at its free end an adjusting screw 66 opposing the tip of a screw 67 held in the framework. The elastic blade 65 is provided at its opposite end with a binding screw 68 holding a wire 69 forming part of an electric circuit. The binding screw 67 also holds a wire 70 forming a part of the electric circuit, said electric circuit including the electromagnet 53. The elastic blade 65 carries midway its ends a point 71 which is insulated from the blade and rides upon the outer ends of the plates 64, and in this position serving to raise the elastic blade 65 sufficiently to separate the contact screws 66 and 67, thereby breaking the electric circuit. In case one of the plates 64 is omitted from the disk wheel 63 as shown at 75, Fig. 5, the point 71 upon reaching the gap thus formed is carried down by the elasticity of the blade 65 until the screws 66 and 67 meet, thereby completing the electric circuit and energizing the electromagnet 53, resulting in the stoppage of the shaft 37 as already described.

The rotation of the winding drum 22 is controlled by the rotation of the shaft 37 through the intermediate gearing, and by means of the change gears between the countershaft 2 and the shaft 37 the rotation of the drum 22 can be varied to change the pitch of the coiled filament. When the rotation of the shaft 37 is stopped, thereby holding the gear 34 from turning, the rotation of the flier frame 25 will carry the gear 33 around the fixed gear 34 and thereby increase the speed of the winding drum 22 and produce a gap between the groups of coiled filament, as represented in Fig. 7, in which 16 represents the steel core upon which the tungsten filament is wound. If, however, the speed of the winding drum be increased as above described, a gap will be formed between the points *a* and *b* of the coiled tungsten filament, as represented at 73, Fig. 7. The extent of the gap 73 is regulated by removing one or more of the adjacent plates 64 and the length of the gap 73 may be determined by the distance, in the periphery of the disk wheel 63 caused by the removal of adjacent plates.

The operation of my improved filament coiling machine is as follows:—A steel wire of the desired size is carried upon the spool 14. The free end of the steel wire which is to form the core about which the tungsten wire is to be wound is conducted through the friction tube 17, hollow bushing 18 and hollow spindle 19, and attached to a stud 20 upon the flange of the winding drum. A tungsten wire taken from a spool, or reel, not shown, supported at the side of the machine, is conducted through the hollow spindle 19 and fastened to the stud 20. The tungsten wire which is to be wound upon the core wire 16 is fed, as represented by the line 74, and means are provided for heating the tungsten wire 74 as it is fed upon the core wire 16. The heating means are not herein shown or described, as it forms no part of my present invention. Any suitable known means for heating the wire may be employed, such for example, as a blow pipe

with its flame directed against the wire, or by causing the wire to form part of an electric circuit. When the coiling has been completed the core wire 16 is eaten out by means of an acid bath leaving the coiled tungsten filament adapted for use in an electromagnet.

I claim,

1. In a wire coiling machine of the class described, a pair of fliers having their axes in alinement, a delivery spool carried by one of said fliers, a winding drum carried by the other of said fliers, said fliers having a communication between said spool and said winding drum coincident with the axes of rotation of the fliers, means for rotating said fliers at a uniform speed, means for rotating said winding drum at a predetermined speed about its axis, and means for automatically increasing the speed of rotation of the winding drum at periodic intervals.

2. In a wire coiling machine of the class described, a pair of rotating fliers having their axes in alinement, a delivery spool carried by one of said fliers, a winding drum carried by the other of said fliers, said fliers having a communication between said spool and said winding drum coincident with the axes of rotation of the fliers, means for rotating said fliers, means for rotating said winding drum at a predetermined speed about its axis, and means for automatically increasing the speed of rotation of the winding drum at predetermined intervals.

3. In a wire coiling machine of the class described, a pair of rotating fliers having their axes in alinement, means for rotating the fliers at a predetermined speed, a delivery spool carried by one of said fliers, a winding drum carried by the other of said fliers, a communication between said delivery spool and said winding drum coincident with the axes of rotation of said fliers, means for rotating said winding drum at a predetermined speed, and means for automatically increasing the speed of rotation of the winding drum for predetermined periods and at predetermined intervals.

4. In a wire coiling machine of the class described, a rotating flier, a winding drum carried by said flier, means for rotating said flier, means for rotating said drum at a predetermined speed independently of the rotation of the flier, and means for stopping said drum rotating means at predetermined intervals.

5. In a wire coiling machine of the class described, a winding drum, means for rotating said drum about an axis passing through the axis of said drum and at an angle thereto, means for rotating said drum about its own axis independently of said first named rotating means, said second rotating means comprising a clutching mechanism, and means for disengaging said clutching mechanism at predetermined periods in the operation of the machine.

6. In a wire coiling machine of the class described, a winding drum, means for rotating said drum about an axis passing through the axis of the drum and at an angle thereto, means for rotating said drum about its own axis comprising a clutching mechanism, means for disengaging said clutching mechanism, comprising an electromagnet, an electric circuit, and means for bringing said electromagnet into the electric circuit at predetermined periods in the operation of the machine.

7. In a wire coiling machine of the class described, a winding drum, means for rotating said drum about an axis passing through the axis of the drum and at an angle thereto, means for rotating said drum about its own axis comprising a clutching mechanism, means for disengaging said clutching mechanism, comprising an electromagnet, an electric circuit, and means for bringing said electromagnet into the electric circuit, for a period of predetermined duration in the operation of the machine.

8. In a wire coiling machine of the class described, a winding drum, means for rotating said drum about an axis passing through the axis of the drum and at an angle thereto, means for rotating said drum about its own axis independently of said first named rotating means, and means for accelerating the rotative speed of said winding drum for predetermined periods and at predetermined intervals.

9. In a wire coiling machine of the class described, a winding drum, means for rotating said drum about its own axis, means for controlling the speed of said rotation, comprising a clutching mechanism, an electromagnet for disengaging said clutching mechanism, an electric circuit including said electromagnet, a spring for closing said circuit, means for holding said circuit open against the tension of said spring for a predetermined period in the operation of the machine, comprising a disk wheel and a series of detachable plates carried by said disk wheel arranged to act against the tension of said spring.

10. In a wire coiling machine of the class described, a winding drum, means for rotating said drum about its own axis, means for controlling the speed of said rotation, comprising a clutching mechanism, an electromagnet for disengaging said clutching mechanism, an electric circuit including said electromagnet, a spring for closing said circuit, means for holding said circuit open against the tension of said spring for a predetermined period in the operation of the machine, comprising a disk wheel and a series of detachable plates carried by said

disk wheel arranged to act against the tension of said spring, and means for varying the speed of said disk wheel.

11. In a wire coiling machine of the class described, a winding drum, a flier carrying said drum, means for rotating said flier about an axis passing through the axis of the winding drum and at an angle thereto, means for rotating said winding drum about its own axis comprising a gear concentric with the axis of said flier, and means for rotating said concentric gear for a predetermined period in the same direction as said flier.

12. In a wire coiling machine of the class described, a winding drum, a flier carrying said winding drum, means for rotating said flier about an axis passing through the axis of the winding drum and at an angle thereto, means for rotating said winding drum about its own axis comprising a gear concentric with the axis of said flier, means for rotating said concentric gear for a predetermined period in the same direction as the flier, and means for checking the rotation of said concentric gear for a predetermined period.

Dated this 21st day of December, 1916.

FRANK H. SLEEPER.

Witnesses:

GEORGE W. HARTLEY,

RUFUS B. FOWLER.