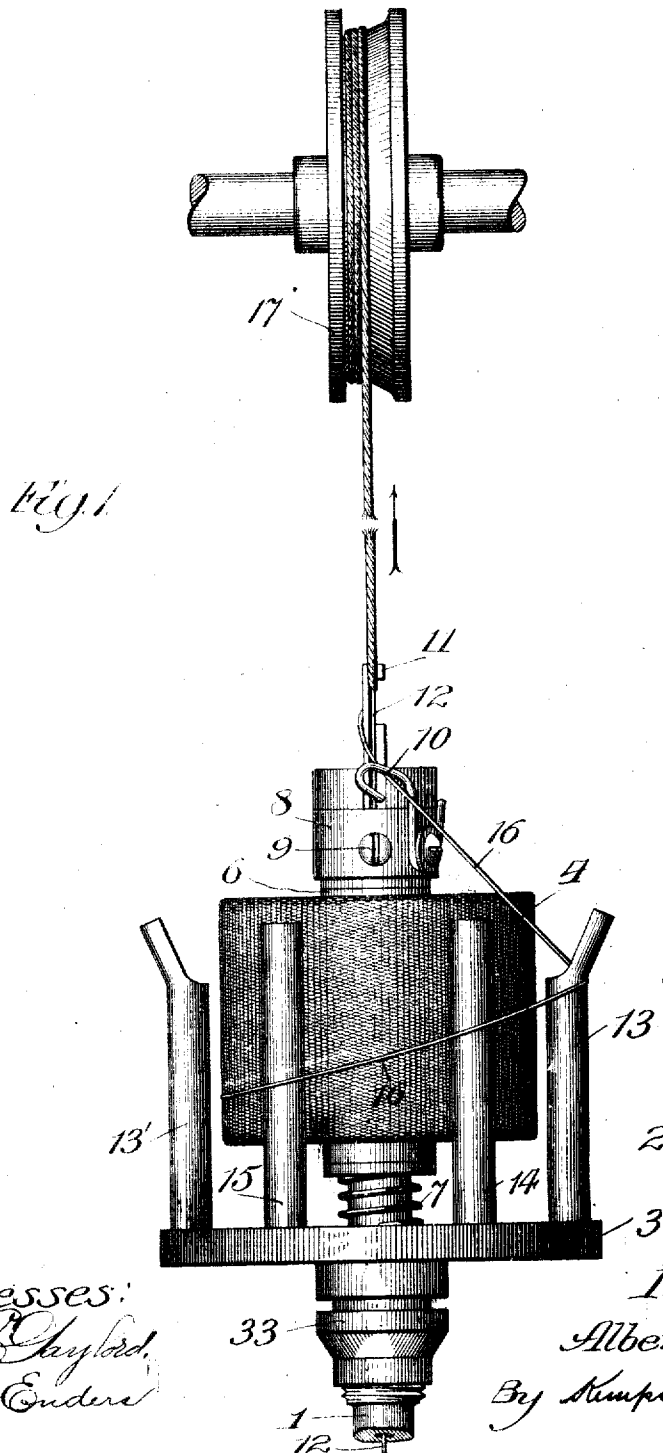


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COVERING MACHINE FOR MAGNET WIRE.
APPLICATION FILED NOV. 28, 1904.

908,539.

Patented Jan. 5, 1909.

2 SHEETS—SHEET 1



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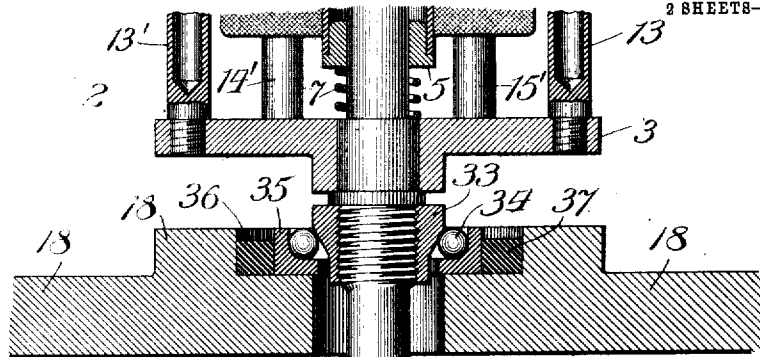


Fig. 2

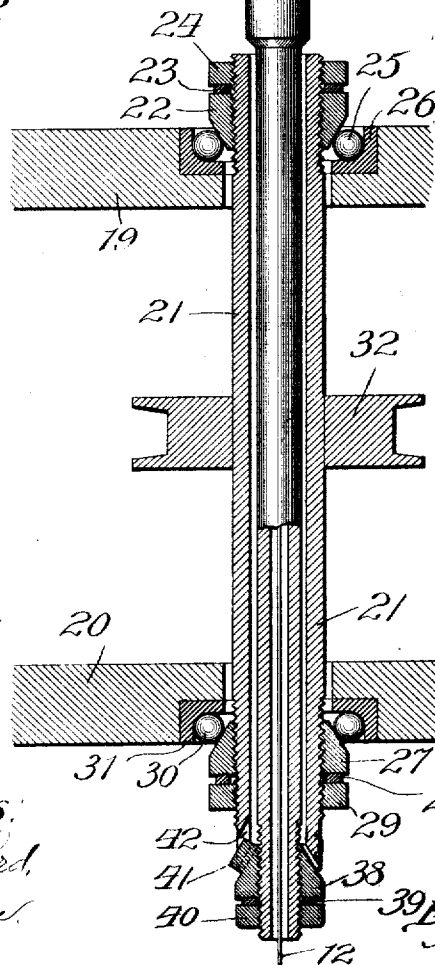
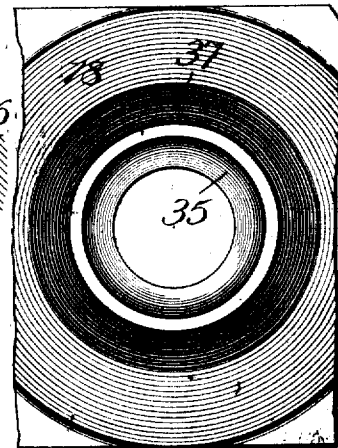


Fig. 3



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UNITED STATES PATENT OFFICE.

ALBERT BEUTLER, OF CHICAGO, ILLINOIS, ASSIGNOR TO BELDEN MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

COVERING-MACHINE FOR MAGNET-WIRE.

No. 908,539.

Specification of Letters Patent.

Patented Jan. 5, 1909.

Application filed November 28, 1904. Serial No. 234,559.

To all whom it may concern:

Be it known that I, ALBERT BEUTLER, a citizen of the United States of America, and resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Covering-Machines for Magnet-Wires, of which the following is a specification.

My invention relates to an improvement in covering machines for magnet wire and has for its object the production of a machine which will not only greatly increase the output for each unit, but effect a marked economy in the amount of silk, cotton or other covering material required for a given length of wire.

In the best machines existing at the time of my invention, the speed of revolution of the head, or part carrying the covering material, has been limited by practical conditions, to not over 4500 revolutions per minute or thereabout. By my improved device I am enabled to obtain a speed as high as, or higher than, 13,000 revolutions per minute, and at the same time secure a thinner and more closely wrapped covering of a very uniform character.

In the accompanying drawings which illustrate my invention, Figure 1 is a view of a complete covering head constructed in accordance with my invention, the bearings and driving mechanism being omitted from this view; Fig. 2 is a view showing particularly the bearings and driving mechanisms, as employed with the head shown in Fig. 1, and, Fig. 3 is a detail of one of the bearings.

In these drawings, the numeral 1, refers to a shaft or spindle upon which the covering head, 2, is mounted. The head which as a whole is referred to by the numeral, 2, is composed of a horizontal plate, 3, of metal, sufficiently strong to resist the breaking stress due to centrifugal action when the spindle is revolving at the high rate of speed contemplated in carrying out my invention. This plate is rigidly secured to the shaft, by a driving fit or otherwise, the shaft projecting a considerable distance above it and forming a bearing upon which a bobbin, 4, of insulating material such as silk or cotton, may revolve. These bobbins of insulating material are well known in the art and are usually constructed by winding the insulating material on a tube of paste-

board, in such manner that the mass of thread binds itself together, thus making the use of heads for the spool unnecessary. This form of bobbin is particularly advantageous in carrying out my invention on account of the fact that there is no superfluous weight to the bobbin, as would be the case where regular spools with metal heads are used. This is not essential to my invention, however, as any of the well-known types of bobbins may be used, providing, of course, they are constructed of sufficient strength, and sufficiently well balanced, to stand the high speed to which my invention subjects them.

In applying one of these bobbins to the head, 2, steel thimbles, 5 and 6, are inserted into the bobbin to assure a proper wearing surface between the bobbin and the shaft or spindle, 1. A friction spring, 7, serves to press the bobbin upwardly against a block, 8, which is put on the upper end of the spindle. The block, 8, is secured in place on the upper portion of the spindle by one or more set screws, 9, the block being pressed down a sufficient distance against the force of the spring, 7, to assure just about the proper amount of friction to prevent the bobbin, 4, from turning too freely on the shaft. It is evident that a certain amount of rotative movement must be allowed for between the shaft and the bobbin, in order that the insulating material may be slowly wound off from the latter. The block, 8, carries a wire eyelet, 10, and a guide, 11, these latter being for the purpose of guiding the insulating material onto the surface of the wire, 12, as it goes up through the hollow spindle.

Arranged near the periphery of the plate, 3, are two posts, 13 and 13', these being tubular throughout their upper portions, as indicated in Fig. 2. These posts are diametrically opposed to each other. Secured in similar manner to the plate, 3, and spaced at an equal distance from the center of the spindle, are the posts 14 and 14', 15 and 15', the posts in each pair being diametrically opposed and the arrangement being such that all six posts are equally spaced with respect to the circumference of the plate, 3. The posts, 13 and 13', are each provided with an outwardly bent portion near their upper extremities, while the other

posts are straight and slightly shorter, these being the only differences between them. The thread, 16, of insulating material, of which the bobbin, 4, is formed, is led in winding off of the bobbin, first around the post, 15, then around the post, 14, and then around the curved longer post, 13, after which it extends through the eyelet, 10, and around the guide, 11, at which point it is wrapped onto the slowly moving wire, 12, that is being insulated. The silk strand, 16, is prevented from pulling off the upper portion of the post, 13, by the outward bend at the upper portion of that post. Above the guide, 11, is a conical take-up wheel, 17, around which the insulated wire is passed several times after which it is led to the reel on which it is wound for safe keeping. This take-up wheel, 17, revolves slowly, being so geared that its speed of rotation will always be a function of the rotation of the shaft, 1, thereby bringing about a certain fixed relation between the speed of the spindle and that of the take-up wheel. This relation is such as to make the longitudinal movement of the wire just sufficient to secure an even laying on of the insulation, brought about by the rotative movement of the spindle and head with respect to the wire.

Referring now to the method of supporting and driving the shaft, 1, which carries the head, 18, 19 and 20, are stationary bars or rails forming portions of the frame of the machine, all being rigidly supported with respect to each other. These bars are preferably of cast iron, and of considerable cross section so as to secure great rigidity, and at the same time afford ample facilities for taking away whatever heat may be generated in the bearings.

21 is a tube, preferably of steel, and accurately turned. This tube is screw threaded at its upper end, to receive the hardened steel cone, 22, which is secured in place by a feathered washer, 23, and jam nut, 24, or in any other suitable way. Where the feathered washer is used, a longitudinal slot is cut in the threaded portion of the shaft, 20, within which the feather on the washer fits to prevent the washer from rotating on the shaft. The cone, 22, rides upon balls, 25, carried in a cup or ball-race, 26, firmly secured within the rail, 19, of the frame of the machine. In a similar manner the lower end of the tube, 21, is screw threaded and carries a cone, 27, secured by a washer, 28, and jam nut 29, in a similar manner to the structure at the upper end of this tube. This cone, 27, bears against balls, 30, which travel in a cup, 31, rigidly supported by the rail or bar, 20. By the means so far described, this tube, 21, which is in itself a hollow shaft, is allowed to rotate freely in the two ball-bearings provided for it, and the

power for driving it is applied by means of a pulley, 32, located midway between the two bearings so that the strain of the belt or other driving means, is equally borne by the two bearings.

The spindle, 1, is screw threaded at a point just below the head, 2, for the reception of a cone, 33, forming one member of a bearing. This cone is adapted to move on a row of balls, 34, rolling in a cup, 35. This cup, 35, forming the non-rotative member of the ball bearing, is mounted in the rail or bar, 18, of the frame of the machine, it resting on the bottom of a chamber, 36, in that rail, which chamber is of much larger diameter than is the cup, 35. Surrounding the cup, 35, and within the chamber, 36, is a ring, 37, of flexible material, preferably rubber, which serves to maintain the approximate alinement of the cup, 35, and other portions of the upper ball bearing with respect to the two ball bearings on the hollow shaft, 21. This ring, 37, is elastic to such a degree as to allow considerable side motion of the cup, 35, and therefore of the upper portion of the shaft, 1, lateral pressure on the shaft, 1, serving to compress the rubber on the side toward which the pressure is exerted, but when the pressure ceases to be exerted, the resiliency of the rubber brings the bearing and the shaft back to its approximately central position within the chamber, 36. The spindle, 1, is hollow throughout its length, to admit of the bare wire, which is to be insulated, passing up through it to the guide, 11. This spindle passes entirely through the hollow shaft, 21, and fits very loosely therein. At its lower portion it is screw threaded to receive the steel cone, 38, which is secured to the spindle, 1, and prevented from rotating thereon by means of a feathered washer, 39, and jam nut, 40. The cone, 38, fits loosely within the countersunk end of the hollow shaft, 21, so as to allow a slight lateral movement between the two. The rotary movement of the hollow shaft, 21, is, however, imparted to the spindle, 1, by means of the pin or spline, 41, carried on the cone, 38, which engages a notch, 42, in the lower portion of the hollow shaft, 21.

By the construction shown and described, the entire spindle and the head which it carries, is capable of considerable lateral motion, especially at its upper end, it being entirely free from the hollow shaft, 21, in this respect. The spindle, however, is caused to partake of the rotary motion of the hollow shaft, 21, by means of the pin and slot, 41 and 42.

Under the extremely high speed of rotation at which I prefer to operate this machine, the spindle, 1, and its head, 2, is allowed to find its own natural center of rotation, on account of the flexibility provided in the bearing at the upper portion of this

spindle, and of the loose connection between the spindle and the hollow shaft which drives it. Under this condition a speed of rotation several times that possible without this flexible mounting, may be attained without undue wear or excessive heating at the various bearings. By making the posts 13, 14, 15, etc., hollow at their upper portions, their mass is considerably reduced without greatly impairing their strength, and these posts are thus enabled to withstand the great centrifugal force to which they are subjected, posts of other designs being often bent at right angles to their normal positions by this force.

I do not wish to limit myself in all respects to the exact construction here shown. It is evident that other flexible and resilient means may be employed for holding the upper portion of the spindle, 1, in its approximately central position. For instance, I have employed coiled springs arranged in suitable manner by the cup, 35, of this bearing to hold the bearing in approximate alinement, and other expedients might be resorted to to accomplish this result. It is obvious also that the loose connection between the hollow shaft, 21, and the spindle, 1, might be modified in many respects, and still allow the same degree of flexibility with respect to the upper portion of the spindle which carries the head. For instance, the lower portion of the spindle, 1, might fit rigidly within the hollow shaft, 21, being accurately centered therewith, the proper degree of flexibility for the upper portion of the shaft being secured through the resiliency of the spindle itself.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a wire covering machine, a hollow shaft, rigidly secured bearings in which said shaft may rotate, a spindle, a covering head carried by said spindle, a flexibly mounted bearing in which said spindle may rotate, and means for imparting the rotary motion of said hollow shaft to said spindle, substantially as described.

2. In a wire covering machine, a hollow shaft, means for revolving said shaft at a high speed, a spindle loosely mounted within said hollow shaft, a head carried by said spindle, means for imparting the rotary motion of said hollow shaft to said spindle, adapted to allow said spindle to rotate on a different axis from that of said hollow shaft.

3. In a wire covering machine, a covering head and a spindle carrying said head, a flexibly mounted bearing in which said spindle is adapted to rotate, and means loosely connected to said spindle for causing said spindle and head to rotate, substantially as described.

4. In a wire-covering machine, an insulat-

ing head mounted upon a hollow spindle, a single bearing in which said spindle may rotate, and a loose engagement between said spindle and a rotating shaft whereby the proper approximate alinement of the spindle is secured and motion is imparted to the spindle, substantially as described.

5. In a wire-covering machine, a hollow spindle an insulating head mounted upon one end of said hollow spindle, a bearing in which said spindle may rotate, and an independently journaled driving means loosely connected to the other end of said spindle, substantially as described.

6. In a wire-covering machine, a spindle, a covering head carried by one end of said spindle, a bearing in which said spindle may rotate, and a tube inclosing the lower end of said spindle and limiting its motion, substantially as described.

7. In a wire-covering machine, a hollow spindle through which the wire is fed, a covering head carried on one end of said spindle and rotating therewith, a bearing in which said spindle rotates, a flexible support for said bearing, and a tube inclosing the lower end of said spindle and limiting its motion, substantially as described.

8. In a wire-covering machine, a hollow spindle through which the wire is fed, a covering head carried on one end of said spindle and rotating therewith, a bearing in which said spindle rotates, an elastic housing for said bearing, and a tube inclosing the lower end of said spindle and limiting its motion, substantially as described.

9. In a wire-covering machine, a hollow spindle, a covering head carried at one end of said spindle, a journal upon said spindle and between the ends thereof and in which said spindle may rotate, an elastic housing for said journal, and means for limiting the gyratory motion of the lower end of said spindle and for imparting a rotating motion to said spindle, substantially as described.

10. In a wire-covering machine, a hollow spindle, a covering head carried by said spindle, a bearing in which said spindle may rotate, a guide with which said spindle may rotate, means rotating said guide and means for imparting the rotary motion of said guide to said spindle, substantially as described.

11. In a covering-machine for magnet wire, a hollow spindle, a covering head carried by said spindle, a bearing in which said spindle may rotate, a guide with which said spindle may rotate, a resilient mounting for said journal whereby a gyratory movement of said journal is permitted, and means for rotating said guide and said spindle, substantially as described.

12. In a wire-covering machine, a hollow spindle, a covering head carried by said spindle, a bearing in which said spindle may

rotate, and a rotating guide with which said spindle may rotate, substantially as described.

13. In a wire-covering machine, a spindle, 5 a covering head carried by one end of said spindle, a bearing in which said spindle may rotate and located between the two ends of said spindle, and a guide controlling the alternative end of said spindle and limiting 10 its motion, substantially as described.

14. In a wire-covering machine, a hollow spindle through which the wire is fed, a covering head carried on one end of said spindle and rotating therewith, a bearing in which 15 said spindle rotates, said bearing being mounted flexibly, and a tube rotatably mounted and inclosing the lower end of said hollow spindle, substantially as described.

15. In a wire-covering machine, a hollow spindle through which the wire is fed, a covering head carried on one end of said spindle 20 and rotating therewith, a bearing in which said spindle rotates, an elastic mounting for said bearing permitting a gyratory motion to said spindle and bearing, and a tubular 25 guide rotatably supported, through which the wire is fed and limiting the gyratory motion of the lower end of said hollow spindle, substantially as described.

Signed by me at Chicago, county of Cook 30 and State of Illinois in the presence of two witnesses.

ALBERT BEUTLER.

Witnesses:

EVA A. GARLOCK,
KEMPSTER B. MILLER.