MACHINE FOR WINDING FIELD COILS

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In commercially used machines for winding, by power, field coils of dynamos, heretofore the guiding of the wire to form the coil has been performed almost always manually. This has been because no sufficiently simple machine was known, that was adaptable to the conditions existing in a plant where the manufacture of motors or generators was mainly for its own use and where the dynamos used by it were repaired by having the coils rewound. A manual guiding of the wire being wound is usually not satisfactory. Wire is particularly hard to guide so that it will lay evenly. The tension required cannot be given satisfactorily by manual strength, nor can the wire be guided manually sufficiently accurately or sufficiently steadily, and consequently the coils are likely either to have spaces between adjacent turns of wire or the turns of wire of the same layer are likely to overlap. If a mechanical tension is interposed between the reel and the coil being wound, handling of the wire to guide it is still difficult.

Machines for winding coils by power are on the market in which the wire is manually guided to the mandrel on which it is wound. They consist, essentially, of a power driven shaft to which the mandrel on which the coils are wound is attached and by which it is driven. With these machines is frequently used a tension device for the wire being wound. These machines frequently have a plurality of driving shafts that revolve at different speeds.

If the coil is wound unevenly either by leaving spaces between the turns or by turns of the same layer riding over each other, the machine ordinarily has to be stopped, the wire unwound and rewound, because unless the layers lie evenly throughout, the likelihood that the coil will short circuit and burn out is increased. An imperfection in one layer or course affects usually several superimposed layers. In manual guiding of the wire of power driven machines, weariness of the operator adds to the likelihood of defective winding.

My device is a simple and efficient machine for windings field coils of electric dynamos, both generators and motors, especially where work is not on a very large scale. The device dispenses entirely with necessity for any manual guidance of the wire. It has a positively moving mechanical guide, the movement of which can nearly synchronize with the progress of the coil layer on the reel, the lateral movement of the wire guide relative to the rotation of the reel being proportioned so that it will feed positively and evenly the wire to the coil; the extent of the lateral movement of the guide at each revolution given to the coil being equal to the portion of the width of the coil occupied by a single turn of wire. I can allow the wire guide to be disengaged from its driving mechanism and adjusted manually to bring it opposite to any point of the coil. The driving mechanism for the guide may have a neutral point so that the reel can revolve without moving the wire guide, and reversing devices are provided whereby the direction of the lateral movement of the wire guide can be reversed at any portion of the winding. My device can be used with a very strong tension, so as to taunt out any wire kinks, and, when well constructed and carefully run, can be adjusted and run with great exactness. My device, too, has provisions by which the lateral movement of the wire guide may be instantly stopped, and also provisions by which this movement can be resumed without delay after such a stop. The stopping and the resuming of this movement may be made by a very simple action of the operator requiring no special care to make. My device may also include means by which the wire may be removed quickly and easily, and without interfering with the rest of the mechanism of the device. The entire device may be attached readily to any of the usual forms of core winders and, in fact, is illustrated as attached to a lathe. In fact it may be attached to any machine tool having a shaft that can be made to rotate conveniently at the required speed and a support for the bracket and the carrier for the wire guide mechanism. It is convenient that the entire wire guide mechanism should be capable of being removed without disturbing the mechanism that carries and rotates the core. In short it is convenient that a cheap machine may be produced that is capable of use in connection with ordinary machinery usually installed in large manufacturing plants using electrical motors and generators, that will be available to wind burned out coils, or coils otherwise requiring repairs, and save the trouble and expense of sending such machinery away for repair. The device may also, of course, be used where electrical machinery is manufactured.

Describing now the best embodiment of my device of which I am at present aware:

Fig. 1 is a plan view of my device. Fig. 2 is a side elevation of my device. Fig. 3 is a plan view of a bracket for the swelling head and the bed plate of the head. Fig. 4 is a fragment of a plan view of the attachment devices for the reel and
its shaft. Fig. 5 is a side elevation of the wire guide and carriage showing the means for its lateral movement and adjustment. Fig. 6 is an elevation of the reversing devices viewed from the side of the power winding device. Fig. 7 is an elevation of the devices for adjusting the driven pulley relatively to the driving disc, and Fig. 8 is a section on the line 8, 8, of Fig. 7.

A power winder, 1, is shown in fragment. Its particular form is not part of my invention. I have shown it in a standard form, in which a casing covers the driving mechanism, through which casing project two power shafts, 2, 200 drivable at two different speeds, the shaft, 2, alone being in use. The shaft, 18, carrying and driving the reel, 62, is suitably attached to the drive shaft 2. The shaft, 18, drives also the driving disc 17, which very conveniently may be clamped against the shoulder.

The width of the reel, 62, and its position along the shaft, 18, may be arranged by spacing the flanges, 19, of the reel from each other.

The wire guide, 35, and its driving mechanism are carried by a swivelling head. I provide a support such as the bracket, 37, for this head that may be carried by the casing of the winder, 1, independently of the drive shaft 2, but positioned conveniently for the operation of this driving mechanism. This bracket and the mechanism carried by it may be removed by unfastening its attachments to the plate 1; or the mechanism supported by it may be removed by removing it from the pivot 28. The entire removal of the head is very advantageous when a layer of heavy wire is to be wound.

The bracket may have the bolt holes 57, 51, 57, by which it may be attached to the casing of the winder 1. By carrying the bracket 37, from this casing independently of the drive shaft 2, it and the parts supported by it can be removed readily from the winder without disturbing the real or the friction drive 17 by which the guiding mechanism is driven, thus allowing the reel and the collar on it to be free from all machinery that might make access to it less free. This is often a great advantage, for instance, when a portion of wire must be wrapped on or wound on by hand, insulation insulated and many other operations.

This head, 70, swivels on a pivot, 29, it carries standards containing bearings for the mechanism for driving the wire guide, 35. This mechanism is driven from the driving disc, 17, and contains means for adjusting the ratio of the speed of revolution of the wire guide to the speed of revolution of the reel, so that the movement of the wire guide will be accommodated to the different gauges of wire wound into coils. It also contains reversing devices to reverse the direction of the movement of the wire guide, so that while the real continuously revolves, the coil will be built up from both directions. The device also comprises a clutching and unclutching mechanism that releases the devices immediately connected to the wire guide.

In practice, I assemble these mechanisms as follows. In the standards, 34, 34, I mount the shaft, 13, which extends partly over the face of the disc, 17, and carries, longitudinally adjustable thereon, along a key way, 14, the friction pulley, 16, which the swivelling of the head will bring against the face of the disc, 17, against which is urged by the spring 39. The face of the disc, 17, and the circumference of the pulley, 16, may be roughened or one of them covered with leather to increase the friction between them. A very convenient means for adjusting the pulley, 16, is a screw threaded spindle, 5, that is provided with a clasp, 15, loosely engaging a retainer, 50, moving with the pulley, 16. The threaded spindle, 5, is held in the clasp, 15, by collars, 51, 52, and can turn in a threaded socket in a standard, 34. By turning the spindle, 5, the diameter of the circular path travelled by the pulley, 16, is adjusted, on the face of the disc, 17, and the speed of rotation of the shaft, 5, relatively to the speed of rotation of the shaft, 16, is controlled. The entire head may be turned manually on the pivot 29 against the tension of the spring 39. A very slight manual movement will remove the wheel 18 from contact with the disc 17, thereby stopping the movement of the wire guide slot c, which movement will instantly recommence the moment the touch of the hand is withdrawn. This function of the head is useful in a number of ways, for instance, if the travel of the wire guide is a trifle too fast, a momentary stoppage will bring the wheel against the drum to the desired closeness. The adjustment of the friction pulley 16 can most advantageously be made when it and the disc 17 are not in contact.

The device I use in practice for the desired movement of translation of the wire guide, 35, is a spindle, 27, having bearings which it revolves in standards carried by the head, 70, and having a screw head, 3, working in a threaded socket in the carriage, 43, which runs on a track, 28, and carries the wire guide, 35. This spindle, 27, is connected up through the reversing mechanism that, in practice, is as follows:—The spindle, 27, has the bevel gear, 24. The pair of connected bevel gears, 12, 12, mounted on the sleeve, 25, and keyed to the shaft, 13, are separated from each other sufficiently so that only one of the gears, 12, will engage simultaneously with the gear, 24. In practice, I separate them enough so that they will be positioned so that both can be out of gear with it. Such a spacing of the gears 12 will produce a clutching and unclutching mechanism, because with both bevel wheels 12 free from the gear 24, the latter and the shaft 45 and consequently the arm 33 can stand stationary while the rest of the driving mechanism is moving, and can be moved backward and forward independently of it. A suitable shifting means is a slide, 10, having an ear, 33, engaging 50 with the sleeve, 25, moved by the lever, 9, pivoted at 8. A good key between the sleeve, 29, and the shaft, 13, is formed by the slots, a, a, and pins, 25, 26. The varying thickness of the wire is provided for by making one arm of the wire guide 65 movable toward and away from the other (see Figs. 1 and 5 particularly). The spacing of the arms is effected in practice by making one of the arms integral with the carriage structure and providing the other with an ear 80, in which the screw 81, seated in an ear 82, attached to the carriage 30 works.

When the machine is operated the pulley, 16, is adjusted by turning the milled head, 4, and the wire guide is positioned by placing both gears, 65, 12, out of mesh with the gear, 24, and turning the head, 31, until the wire guide, 35, is properly positioned. The wire passes through the slot c. The shifting of the gears, 12, 12, will reverse the movement of the wire guide.

I have described with particularity the mechanical details of the preferred embodiment of my invention, but I do not limit myself thereto, and many changes can be made in this embodiment without departing from my invention.
I claim:—

1. In a machine for winding field coils, the combination with a power driven shaft, a reel driven thereby, a driving friction pulley carried by said shaft, a bracket positioned at the side of said reel, and supporting a head swivelling thereon, said head carrying a track, a wire guide travelling upon said track, a shaft extending outward from said head toward the friction drive pulley, a driven frictional pulley engaging with said drive pulley, adjustable along the shaft extending outward, and devices for converting the movement of rotation of said driving pulley into motion of translation of said wire guide.

2. In a machine for winding field coils, a winding assemblage comprising a reel, a frictional driving pulley and a shaft on which said reel and friction pulley are mounted, in combination with a wire guiding assemblage containing a swivelling head on which head are mounted a shaft carrying a friction driven wheel and an arm supporting a wire guide and means for laterally moving the wire guide, comprising a rotating shaft, and a carriage for the wire guide moving on said arm, gears and gear shifting mechanism therefor, interposed between the shaft carrying the frictionally driven wheel, and the rotating shaft comprised in the means for laterally moving the wire guide; and a support for said head independent of the winding assemblage, the said swivelling head and its supported parts forming a single unit that is removable from its support without disturbing the said winding assemblage.

3. In a machine for winding field coils having a power driven shaft and a reel driven thereby, a wire guiding and controlling mechanism comprising a friction drive pulley carried by the shaft, a swivelling head positioned at the side of the reel, said head carrying a track, a wire guide travelling upon said track, a shaft extending outward and sidewise from said head and carrying a driven frictional pulley engaging with and yieldingly urged toward said driving pulley and adjustable along said outwardly extended winding shaft, and devices for converting the movement of rotation of said driving pulley into motion of translation of said wire guide.

4. A machine for winding field coils used in connection with another machine also driven by a power driven shaft therein, comprising a reel driven by said shaft directly, a swivelling head positioned at the side of said shaft, and supported from such machine, a track carried by said head and a wire guide travelling along said track, a friction drive pulley driven by said drive shaft, a driven frictional pulley engaging with said driving pulley and adjustable radially of the same and devices for converting the movement of rotation of the driving pulley into a movement of translation of the wire guide.

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