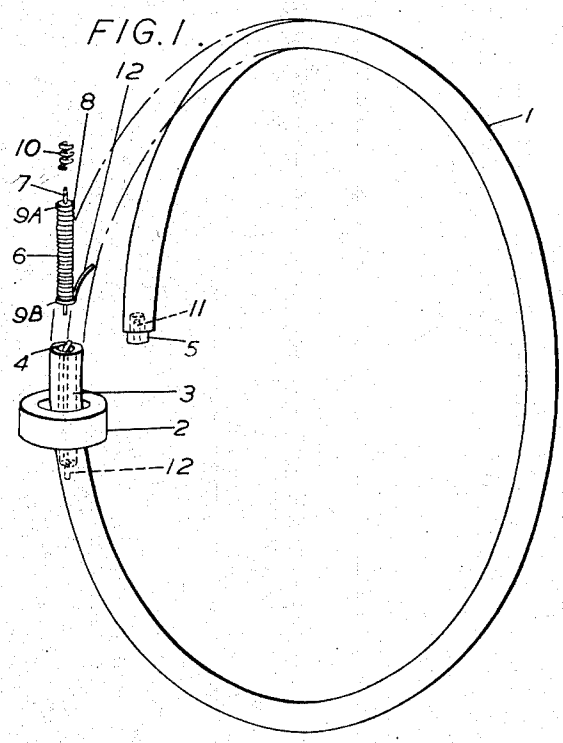
May 11, 1954 J. H. G. CRITCH 2,678,171

COIL WINDING MACHINE

Filed March 5, 1952 2 Sheets-Sheet 1

FIG. 1.



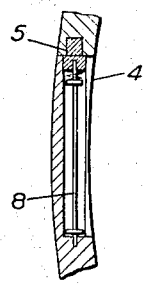


FIG. 2.

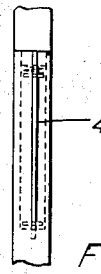


FIG. 2a

FIG. 3.

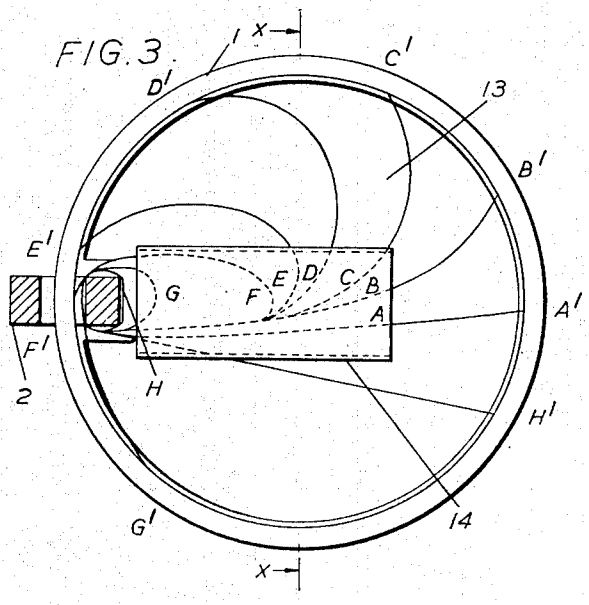
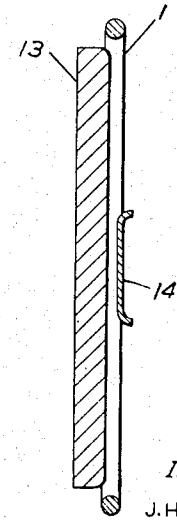


FIG. 4.



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May 11, 1954 J. H. G. CRITCH 2,678,171

COIL WINDING MACHINE

Filed March 5, 1952 2 Sheets-Sheet 2

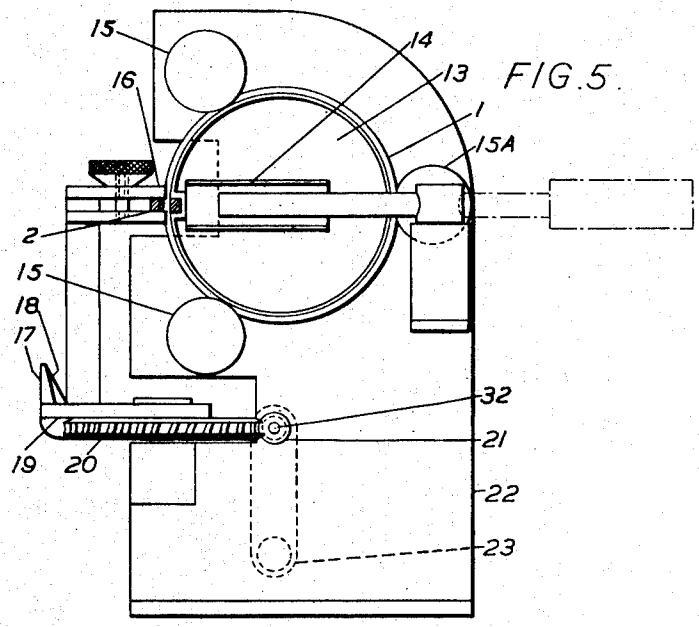


FIG. 5.

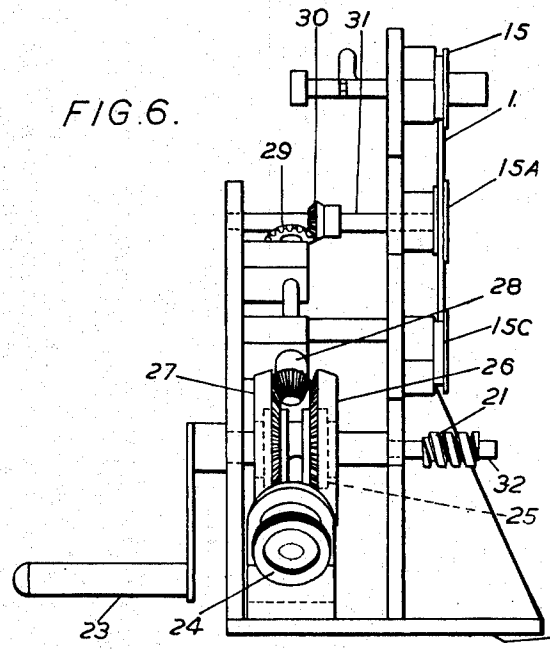


FIG. 6.

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UNITED STATES PATENT OFFICE

2,678,171

COIL WINDING MACHINE

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Application March 5, 1952, Serial No. 274,939

2 Claims. (Cl. 242—5)

1

The present invention relates to coil winding machines and more particularly to machines for winding wire coils on toroidal formers or cores.

According to the invention there is provided a machine for the application of wire or the like to toroidal cores on formers comprising a circular metal ring broken only at one point and capable of distortion about the break to permit access to a cavity in the ring and to permit a toroidal core or former to be threaded on the ring, said cavity having an aperture associated therewith through which wire or the like is delivered from a bobbin located therein.

This and further features of the invention will now be particularly described with reference to the accompanying drawings in which:

Fig. 1 shows a shuttle ring deflected at its joint to permit the introduction of a core or former about the ring and the insertion of the wire supply bobbin in the ring.

Fig. 2 shows, to a larger scale, one view of the unloaded bobbin located in the shuttle ring;

Fig. 2A shows another view of the unloaded bobbin located in the shuttle ring;

Fig. 3 shows diagrammatically the shuttle ring applying wire to a core: the turn being applied is shown at varying instants in one revolution of the shuttle ring.

Fig. 4 is a section x—x of the arrangement shown in Fig. 3.

Fig. 5 is a simplified side view of the machine.

Fig. 6 shows a front view of the shuttle ring driving mechanism from which the coil traversing mechanism has been removed for the sake of clarity.

The parts of the embodiment as shown will firstly be described individually and the way in which they are mutually associated will become clear later.

A shuttle ring 1, Fig. 1, of circular cross-section is cut through (radially) at one point. In one of the (circular) faces thus provided, a cylindrical cavity 3 is drilled and subtends, in the direction of the centre of the ring, a slot 4, see particularly Fig. 2, and Fig. 2A, which may extend along the length of the cavity. A locating stud 5 is situated on the other face, and is adapted for insertion in said first hollow face, for the purposes of locating the two ends of the loop and forming a rigid joint. Both the locating stud and the lower end of the cylindrical cavity are drilled to form bearing journals to receive pivots 7 on the ends of the bobbin 8 which is loaded with turns of wire 6. A small helical spring 10 is positioned over the upper or lower

2

bobbin pivot and is arranged, by being compressed between the locating stud and the upper bobbin flange 9A or between the lower bobbin flange 9B and the bottom of the cavity 3, to retard the rotation of the bobbin and so apply a tension to the wire being fed off it. Suitably selected springs will give the required tensions for different wire gauges.

The shuttle ring is supported on three or more rollers 15A, 15B, 15C Fig. 5 of which at least one 15A is capable of being driven to drive in turn, either by friction or by more positive means such as rack and pinion the said shuttle ring. One or more of these rollers may be temporarily removable to facilitate the opening of the shuttle ring.

The winding former or core 2, Fig. 3 is held in a clamp 16 which can be rotated continuously or in discrete steps about the shuttle ring through a total angle of at least 180 degrees. The automatic traversing of the former is driven by means of the worm 21 which is situated on shaft 32, said shaft being common to a pair of large bevel gears 26 and 27 one or other of which drives in turn bevel gear 28 which extends the means of driving to roller 15A via bevel gears 29 and 30. The clamp may be rotated about the shuttle ring independently of the worm-wheel. This condition is provided for by disengagement from the worm-wheel 20 of a locking pawl 17 which is normally kept in engagement by the pressure of a spring 18. The disengagement of this pawl permits the clamp to be rotated independently of the worm-wheel and to be relocked in any position.

A manually operated version of the machine Figs. 5 and 6 may be driven by means of a cranking handle 23. The cranking handle is connected to spindle 32 Fig. 6 which carries two bevel gears 25, 27 and the worm 21. The worm rotates the core about the shuttle ring in the manner already described. The two bevel gears are part of a reversing gearbox driving the shuttle ring in both directions of rotation and is well known. The shuttle ring is shown driven by roller 15A which is secured to spindle 31. Also secured to spindle 31 is one of a pair of bevel gears 29 and 30, 29 being connected to bevel gear 28 which is part of the reversing gearbox. The shuttle ring reversing facility is under control of the knob 24.

Since the feed-off aperture 4 is on the inner periphery of the ring the wire will be applied virtually in a radial manner to the core or former and this is generally desirable in toroidal coils.

To ensure that the wire does not deviate from this desired plane when each turn is applied to the core, two guide plates 13, 14, Figs. 3 and 4 are fitted to the machine to produce a passageway through which the wire passes.

One of the guide plates backing plate 13 is rigidly fixed to the main body of the machine and one surface provides a plane which is offset from the centre line of the shuttle ring by an amount equal to one half the overall diameter of the wire being used. This arrangement is shown exaggerated in Fig. 4. The other plate, i. e. the loop controlling plate 14 is spring loaded and when there is no wire between the plates, is pressed lightly against the face of the backing plate 13. The working face of the backing plate may be covered with some material e. g. baize or velvet. Means (not shown) are provided to tilt the loop controlling plate about an axis vertical and in a plane substantially parallel to the loop controlling plate. This is to ensure that the loop of wire, while entering the back of the loop controlling device under no great pressure is progressively squeezed tighter between the plates 13 and 14 as the wire loop reduces in size and thus ensures that the loop of wire is firmly controlled right up to the instant at which it falls clear of the plates 13 and 14 and is pulled down on to the coil former. During winding the wire in moving through the passageway forces the loop controlling plate away from the backing plate and the light tension holds the wire in the desired plane during the formation of the loop. This tension also serves to maintain the turn just previously applied to the core or former in position while the formation and application of the subsequent turn is carried out. By this means a turn applied to the former is constantly under tension until the next turn is applied thus obviating the cause of crossed turns. To permit access to the wire during and after winding, the controlling plate 14 is mounted in such a way that it may be swung clear from the backing plate.

In order to understand the invention fully a method of operation will be described.

The loop controlling plate 14 is swung away from the backing plate 13. The roller or rollers 15 which need to be moved to permit the opening of the shuttle ring 1 are pulled away in well-known manner and the joint is opened. The core or former 2 is threaded over the said ring, inserted in the clamp 16 and centralised about the ring.

A bobbin, previously loaded with wire of the required gauge is inserted in the cavity 3 with the free end of wire projecting through the slot 4. The helical tensioning spring, if not inserted before the bobbin, is placed over the upper bobbin pivot 7 and the shuttle ring is then closed and the rollers 15 repositioned.

A small length of wire is withdrawn from the bobbin by pulling the loose end projecting through the shuttle ring slot 4. This is necessary for the formation of the first turn and also checks the bobbin for free rotation. The loop controlling plate 14 is swung into its operating position. To bring the core or former into the desired position for the commencement of winding, the pawl 17 is disengaged and the clamp swung and relocked to the worm-wheel where required.

By turning the cranking handle 23 the ring will rotate, being driven via the two sets of bevel gearing 27, 28 and 29, 30 the spindle 31 and roller 15A, and each time the bobbin passes through the core or former a turn of wire will be applied

to it. At the same time the core or former is traversed about the ring by distributing the winding evenly.

One cycle of the shuttle ring will now be described in detail with reference to Fig. 2. It is first assumed that the position of the bobbin is just above the top surface of the coil former and that no wire has yet passed through the eye of the former. Viewing the machine so that the ring is seen in side elevation with the core clamp to the left-hand side, the ring will be assumed to rotate in an anticlockwise direction.

As the cranking handle is turned the bobbin will pass downwards through the eye of the core taking the trailing end of the wire with it. This end may be anchored about the clamp or held by hand until several turns have been applied when it may be allowed to go free. Further rotation will cause the bobbin to arrive at a point roughly diametrically opposite the core clamp. The wire then stretches across the full diameter of the ring and lies, lightly clamped, between the backing and controlling plates 13 and 14 in position AA'. The rotation of the shuttle ring continues and the bobbin passes through points B', C', and D', during which a loop is formed and is progressively decreased. During this process the part of the loop stretching back to the core or former is kept taut by the backing and controlling plates.

The rotation further continues until positions FF' and GG' are passed and the loop is about to be drawn about the fore. During the whole of this time the loop is held by the two plates 13 and 14, and only as the loop goes from position G to position H where it is being drawn down tightly on to the core is the tension on the loop momentarily relaxed and the loop is immediately tightened on the core. By this time the bobbin has reached point H' and when it travels to A' a short additional length of wire is automatically withdrawn from the bobbin.

The cycle is repeated until the desired number of turns is applied. Any well-known mechanical counting device may be coupled to the machine to count the number of turns automatically.

When the desired number of turns has been applied, the wire from the bobbin is broken off and the end of the coil secured. The roller or rollers 15 are once more moved and the upper part of the shuttle ring deflected to permit the removal of the coil after it has been released from the clamp.

One half of the coil has now been wound and the other half is wound in an exactly similar manner by replacing the former with the wound portion under the clamp. A near-exhausted bobbin may be replaced by a fully charged one at any time when it is necessary to open the shuttle ring for the purpose of replacing a wound former with an empty one.

The machine may be constructed to wind very small coils and moreover will apply successive windings in opposition without having to remove a partially-wound coil from the clamp or reverse the rotation of the driving means.

While the principles of the invention have been described above in connection with specific embodiments and particular modifications thereof, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of the invention.

What I claim is:

1. In a machine for winding toroidal coils on a coil core, a revolving shuttle in the form of a

unitary ring, a bobbin, said ring having a cavity therein adapted to receive said bobbin, said ring having a single break therein at said cavity and being of resilient material adapted to be spread at the break to enable slipping the core on to the ring and to enable the bobbin to be inserted into and withdrawn from said cavity, said ring having sufficient resilience to return to its normal shape upon release of tension thereon.

2. In a machine for winding toroidal coils on a hollow coil core, a revolving shuttle in the form of a unitary ring having a cavity therein adapted to receive a bobbin, said ring having a single

break therein leading into said cavity, said ring being made of material of sufficient resilience to enable spreading the ring at the break to permit the coil core to be slipped to the ring and the bobbin to be inserted into and withdrawn from said cavity, and upon release of tension on said ring to spring back into its original shape.

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