

COIL WINDING DEVICE AND COIL WINDING METHOD

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a coil winding device and a coil winding method for forming a VLF coil and the like to be fixed to a front surface of a deflecting yoke of a television set, for example.

Description of Related Art

A VLF coil for use in cancelling a ultra-low frequency generated by a deflecting yoke is fixed to the front surface of the deflecting yoke of a television set.

As for the related art VLF coil, there has been employed a method for forming separately the two coils wound by the winding machine and for manually inserting the coils into a bobbin.

However, the related art method for manually inserting the two coils wound separately by a winding machine into a bobbin had a problem of getting a low productivity and a poor stability in quality due to the fact that the coils were manually assembled.

In addition, the related art winding machine had a problem that a length of the coil end could not be

changed but kept constant, resulting in that the wire was surplus in its volume to cause a useless application of the wire when the end of the wire was wound at the terminal of the base plate arranged on the bobbin.

Further, the related art had a problem of requiring a large number of assembling steps and soldering steps as well as a high cost due to the fact that the two coils were inserted into the bobbin and soldered to cause the two coils to be used as one coil.

SUMMARY OF THE INVENTION

The present invention has been completed in view of the aforesaid problems and it is an object of the present invention to provide a coil winding device and a coil winding method capable of getting an improved productivity and concurrently a stable quality as well as a reduced cost and a less-expensive coil.

A further object of the present invention will become apparent in sequence as the following description is made.

This object is accomplished in the device of the present invention by arranging a configuration comprised of a bobbin rotating unit for holding a bobbin having a wire wound around it and being rotated; a

nozzle for feeding out the wire in sequence; wire clamp means for clamping a starting end of winding of the wire fed out of the nozzle and being integrally rotated with the bobbin rotating unit; cutting means for clamping a finishing end of winding of the wire and cutting it; and NC control means for controlling of selective motion of the nozzle in a vertical direction substantially at a right angle to a horizontal direction in parallel with an axis of the bobbin, controlling a rotation of the bobbin rotating unit, controlling a clamp of the wire with the wire clamp means and controlling the clamp and cutting of the wire with the cutting means.

In addition, in the case that the present invention is to be performed, the cutting means can adjust optionally a length of the finished end of the wire of winding operation which is fed out of the bobbin, or there may be provided grooves for use in guiding the wire at an outer circumference of the bobbin so as to wind the wire in the grooves and in addition, the wound coil can be utilized as a VLF coil.

In addition, this object of the present invention can be accomplished by the method wherein NC control means continuously controls a rotation of a bobbin rotating unit for holding the bobbin to wind up a

wire and rotating the bobbin, a feeding-out of the wire through a nozzle for feeding out the wire in sequence, a wire clamping operation of the wire clamping means for clamping a winding starting end of the wire fed out of the nozzle and integrally rotating it with the bobbin. rotating unit, clamping and cutting operations of the cutting means for clamping the finished end of the winding of the wire and cutting it, and then the wire is automatically wound in the bobbin.

According to the present invention, it is possible to perform an automatic winding of the wire and to form simply a predetermined coil.

In addition, in the case that the cutting means can adjust optionally the length of the finished end of winding of the wire to be fed out of the bobbin, a coil having always a proper length and useless volume of wire end can be attained.

In addition, in the case that an outer circumference of the bobbin is provided with grooves for guiding the wire and the wire is wound in the grooves, a position setting of the coil on the bobbin can be performed easily and accurately.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a flow chart for showing one example of a procedure of operation in the device of the present invention.

Fig. 2 is a schematic view for showing an arrangement of the device of the present invention.

Fig. 3 is a schematic perspective view for showing a configuration of a wire clamp part in the device of the present invention.

Fig. 4 is a schematic view for showing a configuration of the wire clamp part in the device of the present invention.

Fig. 5 is a schematic perspective view for showing a configuration of a clamp cutting part in the device of the present invention.

Fig. 6 is a schematic view for showing a wire winding path for a bobbin in the device of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, one preferred embodiment of the present invention will be described in detail as follows.

Fig. 2 is a schematic view for showing a configuration of a coil winding device shown as one

preferred embodiment of the present invention. In Fig. 2, this coil winding device is generally comprised of a bobbin rotating unit 1; a wire nozzle part 2; a wire clamp part 3; a clamp and cutting part 4; a wire nozzle part moving mechanism 5; an NC control part 6; and a base 7 having these components arranged thereon and the like.

More particularly, a wire supplying part 10 having wires 8 wound and stocked there is installed on the base 7, the wire 8 from the wire supplying part 10 is supplied to the wire nozzle part 2 through a plurality of guide rollers and the like, and the wires can be fed out in sequence from the extremity end of the nozzle 2a.

The bobbin rotating unit 1 can be rotated in both normal and reverse directions by a motor not shown and the extremity end of the bobbin rotating unit has a chuck part 11 to which the bobbin 9 can be removably attached. Then, the bobbin 9 is fixed to the chuck part 11, and the bobbin 9 and the chuck part 11 can be integrally rotated.

In addition, the bobbin 9 is formed substantially in a cylindrical shape, a base plate 92 having V-grooves 91 for holding the wire ends is fixed

to one end of the bobbin, and an outer circumference of the base plate is formed with grooves 93 for winding the wire 8. Then, in the preferred embodiment, the wire 8 is wound on the bobbin 9 in paths denoted by reference symbols a to m, wherein two coils 8A and 8B are formed concurrently. That is, the wire is started to be wound from the position of the reference symbol a through the V-groove 91 and wound by five times at the path of one coil 8A passing through the reference symbols b - c - d - e - f, respectively, thereafter the wire is wound by five times at the path of one coil 8B ranging from the reference symbol c to g - h - i - j - g and then the wire is wound under a state in which the wire passes from the reference symbol j through k - l - V groove 91 to a reference symbol m.

As Figs. 3 and 4 show a configuration of a substantial part of the wire clamp part 3, the wire clamp part is constructed such that it has a pair of holding members 31 and 31 abutted to each other and spaced apart from each other under an operation of an actuator not shown, wherein one end of the wire 8 is clamped at extremity ends of the pair of holding members 31, and can be rotated integral with the chuck part 11 of the bobbin rotating unit part 1.

As Fig. 5 shows a configuration of a substantial part of the clamp and cutting part 4, the clamp and cutting part has a pair of holding members 41 and 42 abutted to each other and spaced apart from each other under an operation of an actuator not shown. In addition, the pair of holding members 41 and 42 are constructed such that they can be integrally moved in the same direction (an arrow C-D direction as viewed in Fig. 5), concurrently their positions in respect to the chuck part 11 can be optionally changed over and the extremity end of one holding member 42 is formed with a cutting blade 43.

The wire nozzle part moving mechanism 5 has a Y-axis direction moving part 5a for moving the nozzle 2a in a vertical direction (an arrow E-F direction as viewed in Fig. 2) and an X-axis direction moving part 5b for moving the nozzle 2a in a horizontal direction in respect to a forward or a rearward direction (an arrow A-B direction as viewed in Fig. 2) in parallel with an axis of the bobbin 9.

Data corresponding to a coil shape wound on the bobbin 9 to be set is set to the NC control part 6, and the NC control part can control a wire feeding amount of the wire fed out of the wire nozzle 2 in

response to the data, a rotation of the bobbin rotating unit part 1, a wire clamping at the wire clamping part 3, wire cutting at the clamp and cutting part 4, and an operation of the wire nozzle moving mechanism 5 while being released from each other. Fig. 1 is a flow chart of a procedure of operation in which the coil winding device is controlled by the NC control part 6. In this case, referring to the flow chart shown in Fig. 1, an entire operation of the coil winding device will be described as follows.

At first, under a state in which a vacant bobbin 9 is set at the bobbin rotating unit part 1, the nozzle 2a is lowered by the wire nozzle part moving mechanism 5 (an arrow F direction as viewed in Fig. 3) and then the wire clamp part 3 clamps the extremity end of the wire 8 fed out of the extremity end of the nozzle 2a to cause the part denoted by the reference symbol a in Fig. 6 to be led and moved toward the bobbin 9 (an arrow B direction in Figs. 3 and 4). In addition, when the wire is led onto the bobbin 9, the midway part of the wire 8 is held in the V-groove 9l at one side.

Then, under a cooperative relation between a forward or rearward motion of the nozzle 2a with the wire-nozzle part moving mechanism 5 and a rotating

operation of the bobbin 9 with the bobbin rotating unit part 1, the coil shown in Fig. 6 is wound on the bobbin 9 and held in the V-groove 91 at the winding finished end, thereafter the wire is taken out as a lead end shown by the reference symbol m. In addition, as the nozzle 2a is moved up to the position at the clamp and cutting part 4, the clamp and cutting part 4 is moved in an arrow D direction as viewed in Fig. 5 and the wire 8 is held between the pair of holding members 41 and 42. Then, the nozzle 2a is lifted up in a direction indicated by an arrow E in Fig. 5, thereafter moved in a direction indicated by the arrow B as viewed in Fig. 5. Then, at this time, the wire 8 fed out of the nozzle 2a is cut, thereby a VLF coil having the desired windings applied on the bobbin 9 is completed. Then, the same operation as above is repeated again and similar VLF coils are made in sequence. In the case that the length of the winding finished end is to be changed, the position of the clamp and cutting part 4 in respect to the chuck part 11 is changed, thereby the length can be optionally adjusted.

Accordingly, in the case that the coil winding device of the preferred embodiment is applied, the wire 8 can be automatically wound at the bobbin 9 to form a

desired coil, so that it is possible to perform an efficient and easy manufacturing of coil having a stable quality.

Further, since the clamp and cutting part 4 (cutting means) can adjust optionally a length of the winding finished end of the wire 8 fed out of the bobbin 9, the coil having the proper length wire end with no useless volume can always be obtained.

In addition, the outer circumference of the bobbin 9 is provided with grooves for use in guiding the wire 8 to wind up the wire in the grooves, so that the position setting of the coil on the bobbin 9 can be performed easily and accurately and further a stable quality can be attained.

In addition, the two coils 8A and 8B can be made concurrently, so that the related art soldering device in assembling the VLF coil can be eliminated.

In addition, although the preferred embodiment has been described in reference to the case in which the VLF coil is manufactured, it is of course apparent that the present invention can be applied similarly to other coils than this preferred embodiment.

As described above, according to the present invention, it is possible to make an easy formation of

the desired coil by winding the wire automatically on the bobbin and to perform an efficient production of the coil having a stable quality.

In addition, in the case that the cutting means can optionally adjust the length of the winding finished end of the wire fed out of the bobbin, the coil having always a proper length and no useless volume can be attained.

Further, in the case that the outer circumference of the bobbin is provided with grooves for use in guiding the wire and the wire is wound in the grooves, there may be expected to have an effect that the position setting of the coil on the bobbin can be easily and accurately performed.

What is claimed is:

1. A coil winding device, an improvement comprised of:

a bobbin rotating unit for holding a bobbin having a wire wound around it and being rotated;

a nozzle for feeding out said wire in sequence;

wire clamp means for clamping a starting end of winding of said wire fed out of said nozzle and being integrally rotated with said bobbin rotating unit;

cutting means for clamping a finishing end of winding of said wire and cutting it; and

NC control means for controlling of selective motion of said nozzle in a vertical direction substantially at a right angle to a horizontal direction in parallel with an axis of said bobbin, controlling a rotation of said bobbin rotating unit, controlling a clamp of said wire with said wire clamp means and controlling the clamp and cutting of said wire with said cutting means.

2. A coil winding device as set forth in claim 1 in which said cutting means can adjust optionally a length of the finished end of winding of said wire fed out of said bobbin.



3. A coil winding device as set forth in claim 1 in which an outer circumference of said bobbin is provided with grooves for use in guiding said wire and said wire is wound in said grooves.

4. A coil winding device as set forth in claim 1 in which the wound coil is utilized as a VLF coil.

5. A coil winding method wherein NC control means continuously controls a rotation of a bobbin rotating unit for holding the bobbin to wind up a wire on it and rotating the bobbin, a feeding-out of the wire through a nozzle for feeding out said wire in sequence, a clamping operation for said wire of wire clamping means for clamping a winding starting end of said wire fed out of said nozzle and integrally rotating it with said bobbin rotating unit, said clamping and cutting operations of means for clamping and cutting the finished end of winding of said wire, and then said wire is automatically wound in said bobbin.

6. A coil winding method as set forth in claim 5 wherein an outer circumference of said bobbin is provided with grooves for guiding said wire and said wire is wound in the grooves.

