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H. R. LOUBET

1,940,175

METHOD AND DEVICE FOR WINDING A FILIFORM MEMBER WITHIN A HOLLOW BODY

Filed April 14, 1933

2 Sheets-Sheet 1

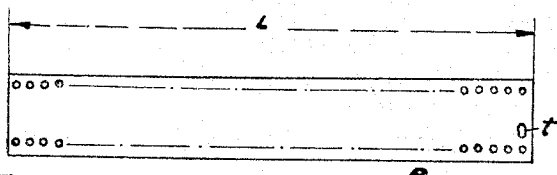


Fig. 1

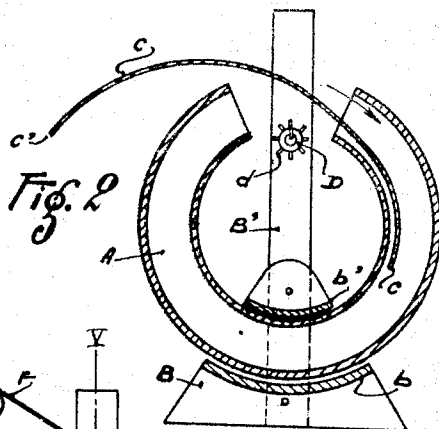


Fig. 2

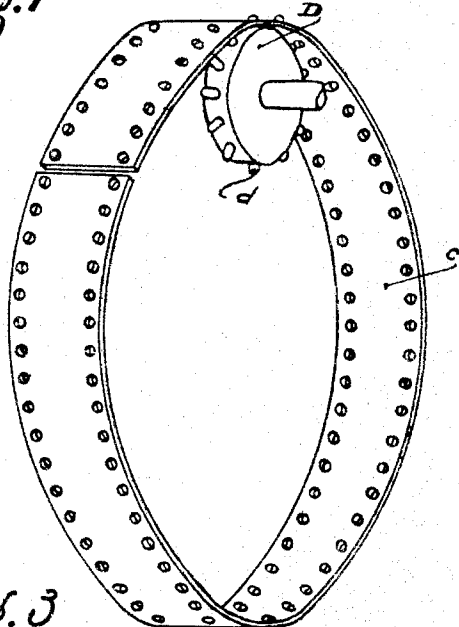


Fig. 3

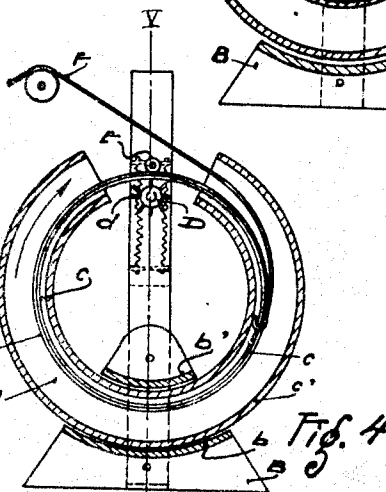


Fig. 4

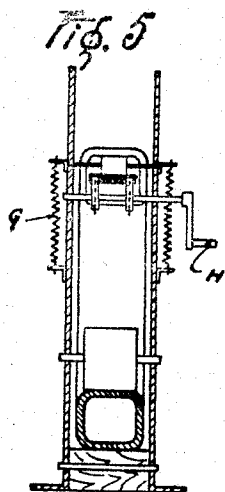


Fig. 5

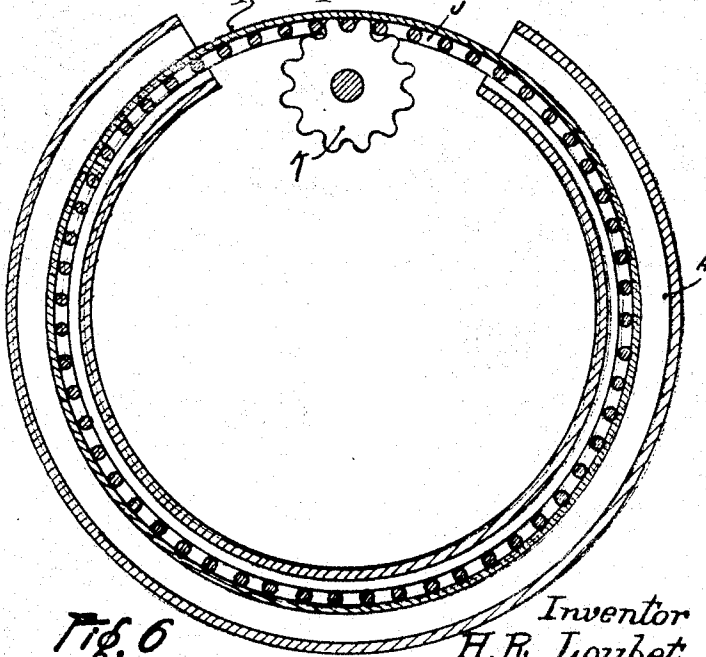


Fig. 6

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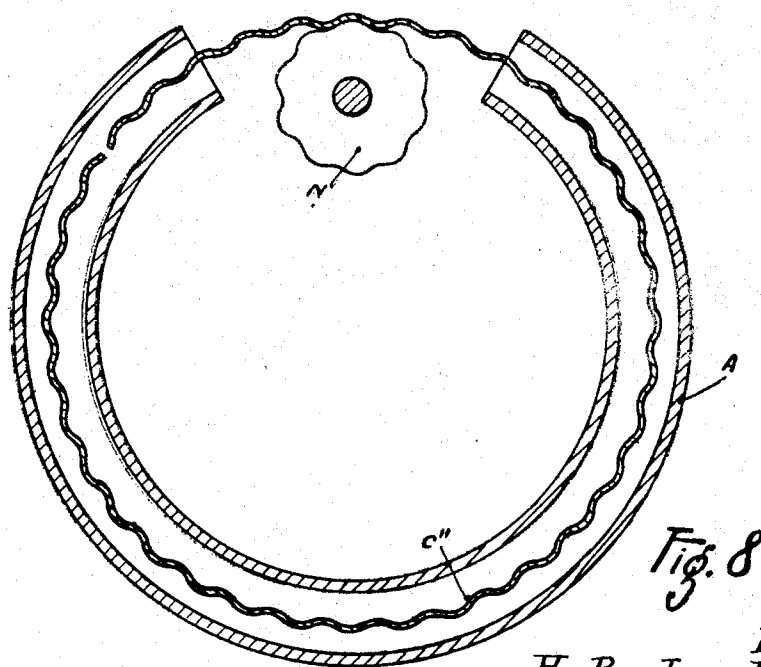
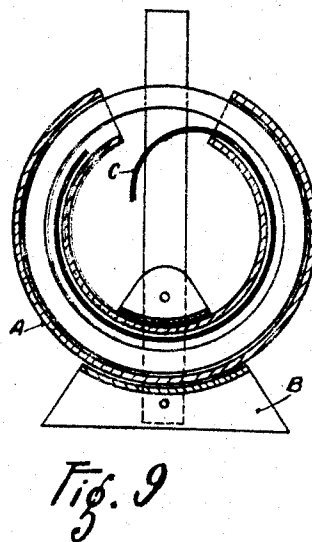
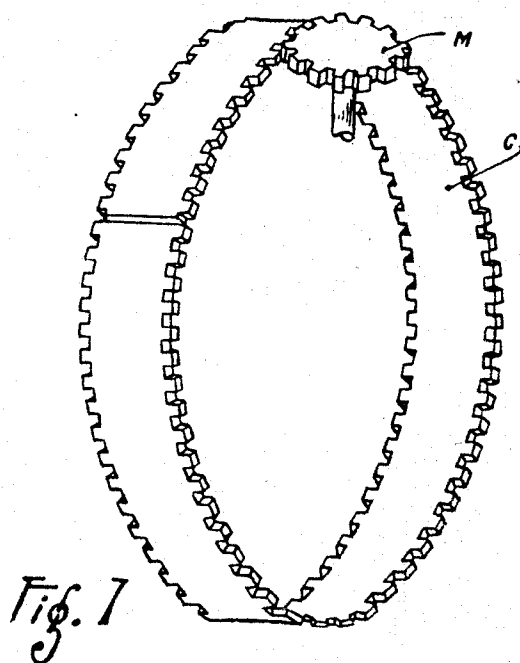
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

1,940,175

METHOD AND DEVICE FOR WINDING A
FILIFORM MEMBER WITHIN A HOLLOW
BODY

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Application April 14, 1933, Serial No. 666,210,
and in France May 13, 1932

11 Claims. (Cl. 242-4)

The present invention relates to a method of mechanically winding a uniform coil within a hollow member which may be of annular shape. The unit formed by this member and its inner coil is used for constructing transformers and particularly current transformers which will be free from distortion in the case of short-circuits, or any other apparatus requiring one or more coils.

The principle of the present invention consists in feeding the wire to be wound within the annular member, through the medium of an auxiliary flexible member (strip, chain, etc.) previously introduced therein and forming a continuous ring capable of rotating freely in said member when driven mechanically, and which may rest in place or be withdrawn at will once the winding has been finished.

In the accompanying drawings, a particular embodiment of the process has been illustrated merely by way of example, in order that the invention may be more readily understood, such embodiment not, however, limiting the invention either as regards form, dimensions or mechanical arrangements utilized.

In Fig. 1 is illustrated the development of the flexible driving member.

Fig. 2 illustrates said flexible member in process of being introduced into the hollow member which is to receive the winding.

Fig. 3 is a perspective view of the flexible member after it has bent into a loop and of one of the sprocket wheels for rotating it.

Fig. 4 illustrates in front view the thread to be wound which is fastened at one end to the flexible driving member once the latter has been mounted in position within the hollow member.

Fig. 5 is a cross-section on the line V—V, Fig. 4.

Figs. 6, 7 and 8 illustrate modifications in the form of the flexible member.

Fig. 9 shows the flexible member being withdrawn after the winding has been completed.

As shown in Fig. 1, the driving strip C is of length L which is at least equal to the smallest inner circumference of the hollow member A which in the figures has been represented as being annular.

Near the edges of the strip C are formed two rows of holes for permitting said strip to be fed

forward in a manner presently to be described. In addition to said holes, there is provided, preferably near one end of the strip, a fastening device which may take the form of either a hole or a hook *t* for enabling the thread to be wound to be attached to the strip C.

The hollow member A is mounted on a frame B, being clamped between strips *b* and *b'* integral with the frame and made of suitable material (metal, wood, rubber, etc.).

The driving strip C having been previously introduced into the member A as shown in Fig. 2, the end of the wire F to be wound is fastened to said strip C at *t*. When the strip C has made a complete loop within the member A, its ends either contact or overlap, and the strip C forms a continuous ring freely rotatable within the member A.

In Figs. 3 to 5 has been illustrated the device for rotating the strip C within the hollow member A, whereby the wire F is wound within said member. Such driving mechanism may comprise sprocket wheels D whose sprockets, as shown more clearly in Fig. 5, engage in the perforations in the strip C, enabling the latter to be readily rotated, for example by means of the crank handle H, whereby the wire F may be mechanically wound within the member A at the requisite speed and with the desired uniformity.

In the course of this operation, one or more press rolls, such as E, which are urged towards the centre of the strip C by the springs G, press said strip against the sprocket wheels D.

Obviously the crank handle H may be replaced by a pulley or a toothed pinion, in order to enable the mechanism to be driven through the agency of a motor either directly coupled or through the medium of a reducing gear train, a belt, chain etc. Similarly, the rolls E may bear either against the strip C, or against the winding which is being formed on said strip.

Once the winding is completed, the strip C may be brought into such a position that one at least of its ends *c* or *c'* is accessible. It may then be withdrawn, as shown in Fig. 9. The withdrawal of the strip C is facilitated moreover by introducing prior to starting the winding, a second strip I between the strip C and the first layer of the wire F. Moreover the strip I need

not be wider than the layer of thread, increased by the marginal insulation, nor need it have perforations engaging with the driving mechanism. Moreover additional strips I may be introduced in the course of winding between the successive layers of wire, either to insulate them or to make the unit more rigid.

The strips C and I may be made indifferently of metal or insulating material; however, in practice, it would appear to be indicated to make the strip C of metal and the strip I of an insulant.

The mechanical driving device described above merely by way of example may be replaced by any other without departing from the scope of the invention. Thus the strip C could be replaced by an equivalent length of Gall's chain as shown at J in Fig. 6 driven by a single sprocket wheel K and over which it would be sufficient to lay a strip I as previously described, before beginning the winding.

Another modification of the strip C has been illustrated in Fig. 7 where such strip is formed with teeth C' along both of its edge portions, each of said toothed edge portions gearing with a toothed wheel M, the axes of said toothed wheels (only one shown in the drawings) being parallel and perpendicular to the axis of the strip C.

In another modification illustrated in Fig. 8, the strip C is made of sheet metal having corrugations C'' which may be perpendicular or oblique to the direction of rotation, the strip C being rotated in this case by a cylinder N having channelings.

Without departing from the scope of the present invention, several wires F, variously placed, may be wound on the strip C instead of a single one, in order to form several coils, either in a single operation, or in successive operations.

Once the winding has been built up within the member A, and the driving member withdrawn or not as the case may be, the empty space remaining within the hollow member may be filled with a hot liquid material, which solidifies on cooling and suitably holds the coil, solid granules such as sand for example being mixed, if needs be, with said material.

In practice, the annular member A, within which a coil is wound by the process described according to the present invention, is made of insulating material, but it is evident that the process is independent of the nature of said member. In particular, the latter may be a complete insulator, or may be an insulator in the direction of its thickness and a conductor over the whole or part of its inner or outer surface, or may be wholly a conductor.

Finally, the process is applicable in a general manner to a hollow body of annular form which, as a particular case, may be circular, oval, oblong, etc. or may even include rectilinear portions joined together by portions sufficiently bent to enable the driving member to be displaced.

I claim:

1. A method of winding a filiform member within a hollow body, which consists in introducing into said hollow body a flexible driving member and bending said driving member into a loop, in attaching to said driving member one end of the filiform member to be wound, and in rotating said driving member to wind said filiform member in said hollow body.

2. A method of winding a filiform member within a hollow body, which consists in introduc-

ing into said hollow body a flexible driving member and bending said driving member into a loop, in attaching to said driving member one end of the filiform member to be wound, in rotating said driving member to wind said filiform member in said hollow body, in unfastening said filiform member from said driving member after the winding has been completed, and in removing said driving member from said hollow member.

3. A method of winding a filiform member within a hollow body, which consists in introducing into said hollow body a flexible driving member and bending said driving member into a loop, in attaching to said driving member one end of the filiform member to be wound, in introducing a flexible strip into said hollow member and wrapping it round said driving member, in rotating said driving member to form a winding of said filiform member on said flexible strip, and in withdrawing said driving member from said hollow member once said winding has been completed.

4. A method of winding a filiform member within a hollow body, which consists in introducing into said hollow body a flexible driving member and bending said driving member into a loop, in attaching to said driving member one end of the filiform member to be wound, in rotating said driving member to wind said filiform member in said hollow body, and in pouring into said hollow member a molten substance which on solidifying holds said winding in place.

5. A device for winding a filiform member within a hollow body, comprising, in combination, a flexible driving member forming a closed loop in said hollow member, one end of the filiform member to be wound within said hollow body being attached to said driving member, and means for rotating said driving member.

6. A device for winding a filiform member within a hollow body, comprising, in combination, a driving member in the form of a flexible strip forming a loop in said hollow member and having perforations along its edges, one end of the filiform member to be wound within said hollow body being fastened to said driving member, and sprocket wheels engaging with the perforations in said driving member for rotating the latter whereby said filiform member is wound within said hollow body.

7. A device for winding a filiform member within a hollow body according to claim 6, in combination with a press roll, and means for pressing said press roll against said driving member to maintain the latter in engagement with said sprocket wheels.

8. A device for winding a filiform member within a hollow body, comprising, in combination, a flexible driving member introduced into said hollow body to form a closed loop therein and to which one end of said filiform member is fastened, said driving member being formed with teeth along both its edges, and two sprocket wheels respectively engaging with said toothed edges of said driving member to rotate same whereby said filiform member is wound within said hollow body.

9. A device for winding a filiform member within a hollow body, comprising, in combination, a flexible chain introduced into said hollow body to form a closed loop therein and to which is fastened one end of the filiform member to be wound, and a sprocket wheel engaging with said chain to rotate same whereby said fili-

form member is wound within said hollow body.

10. A device for winding a filiform member within a hollow body, comprising, in combination, a flexible corrugated member forming a
5 loop in said hollow body, a rotatable cylinder having channelings engaging with the corrugations of said flexible member for rotating same, said filiform member being fastened at one end to said corrugated member whereby said filiform
10 member is wound within said hollow body.

11. A method of winding a filiform member within a hollow body, which consists in introducing into said hollow body a flexible driving

member and bending said driving member into a loop, in attaching to said driving member one end of the filiform member to be wound, in introducing a flexible strip into said hollow body and wrapping it round said driving member, in
80 rotating said driving member to form a winding of said filiform member on said flexible strip, in withdrawing said driving member from said hollow body once said winding has been completed, and in pouring into said hollow body
85 a molten substance which, on solidifying, holds said winding in place.

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