

Nov. 17, 1936.

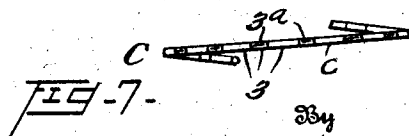
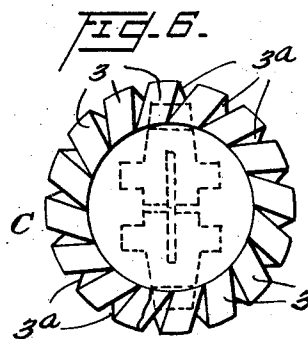
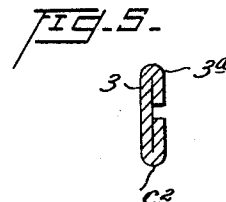
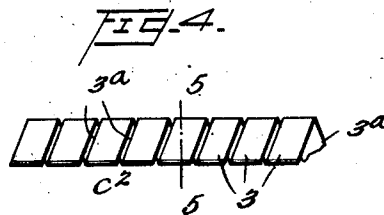
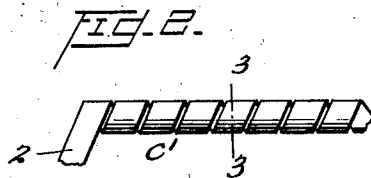
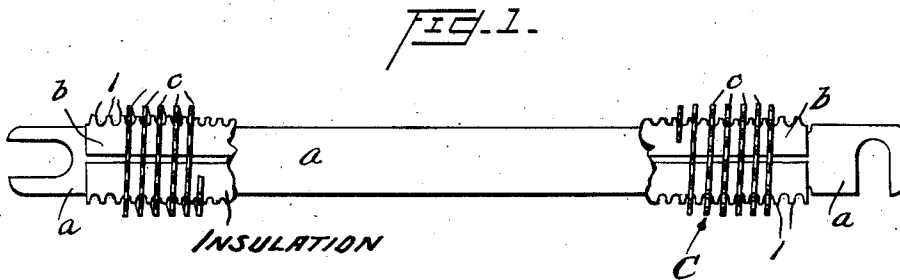
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2,061,516

METHOD OF MAKING EDGEWISE WOUND RESISTANCE COILS

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2 Sheets-Sheet 1



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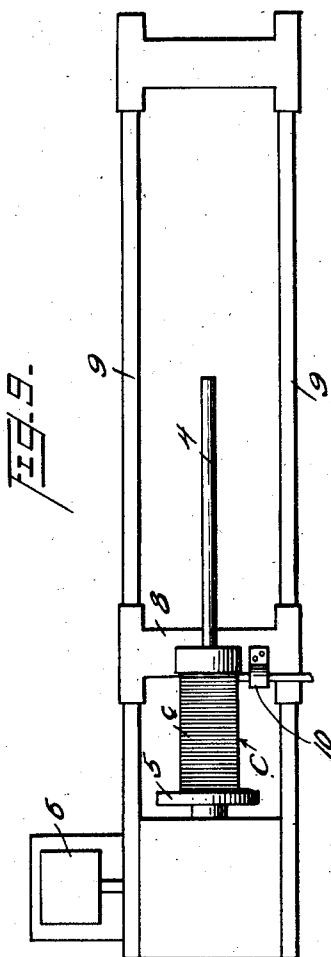
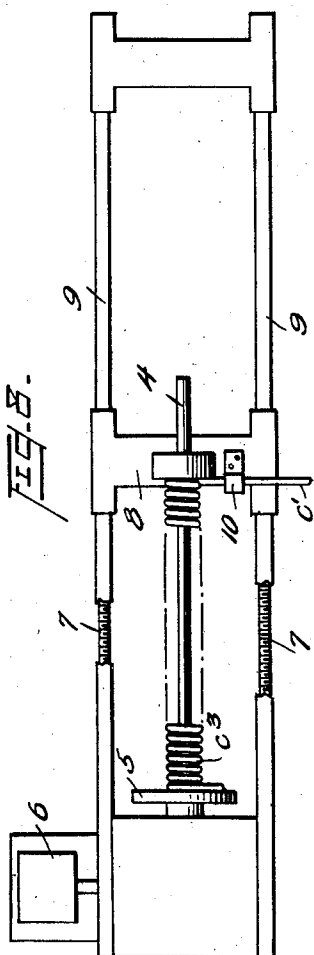
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METHOD OF MAKING EDGEWISE WOUND RESISTANCE COILS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,061,516

METHOD OF MAKING EDGEWISE WOUND
RESISTANCE COILSJoseph F. Frese, Baltimore, Md., assignor to Mon-
itor Controller Company, Baltimore, Md., a cor-
poration of Maryland

Application November 20, 1935, Serial No. 50,796

1 Claim. (Cl. 29—155.5)

This invention relates to improvements in a method of making edgewise wound resistance coils. In the patent to George H. Whittingham Number 1,687,357, dated October 9, 1928 are shown resistance units arranged in banks, each unit consisting of a flat metal bar having an insulating covering with teeth on its opposite edges and a coil composed of a ribbon of resistance metal wound on edge, the coil being threaded onto the covering and its convolutions being spaced apart by the teeth. The main purpose of the present invention is to provide an edgewise wound coil which, for a given length of coil, will have a greater length of ribbon than a plain edgewise wound coil made from a ribbon of the same width and thickness. Thus, a coil made in accordance with the present invention from a strip of resistance metal of given width and thickness, while occupying the same lineal space on a supporting core of the kind disclosed in said patent, will have several times the total resistance of the plain coil.

In the accompanying drawings,

Fig. 1 is a side elevation of a resistance unit having an edgewise wound coil made in accordance with my invention, the end portions only of the coil being shown in full lines;

Fig. 2 is a side elevation of a helix made from a flat metal strip, illustrating the first step in the method of making the coil;

Fig. 3 is a cross-section through the same on the line 3—3 of Fig. 2;

Fig. 4 is a side elevation of the helix after it has been flattened;

Fig. 5 is a section on the line 5—5 of Fig. 4;

Fig. 6 is a side elevation of one convolution of the completed coil;

Fig. 7 is an edge view of the same;

Fig. 8 illustrates in side view the helical tube of Fig. 2 and 3 coiled helically upon a core bar, and,

Fig. 9 illustrates a method of flattening the convolutions of the coil of Fig. 8 by pressure applied at the ends of the coil.

Referring to Figs. 1 to 6, inclusive, of the drawings, *a* represents a flat supporting bar having an insulating covering *b* provided with staggered teeth or projections *1* on its opposite edges and *C* indicates the edgewise wound coil of my invention threaded onto the insulator, the convolutions *c* of the coil being spaced apart by the teeth.

In making the coil in accordance with the method disclosed in Figs. 2 to 6, inclusive, a flat strip of resistance metal *2* is coiled closely into the form of a helically wound tube *c'*, Figs. 2 and 3. This tube is then flattened by any suitable means,

forming a flat zigzag strip *c''*, Figs. 4 and 5, in which the parts *3* at one side of the strip slope in one direction and are folded against the parts *3^a* at the opposite side of the strip which slope in the opposite direction. The zigzag folded strip *c''* is then coiled on edge around a cylindrical bar in a suitable coiling machine which has the effect of stretching the strip toward the outer edge of the coil, as shown in Figs. 6 and 7, so that the folds *3* are pulled apart and the folds *3^a* are also pulled apart, leaving V-shaped gaps between the folds on each side of the coil, which gaps are crossed diagonally by the folds on the opposite side of the coil.

The zigzag edgewise wound coils may be made in continuous lengths and cut to suit the length of the insulating support. As compared with a plain edgewise wound coil made from a metal strip of the same width and thickness, and having a sufficient number of convolutions to fill the grooves on the supporting member, the zigzag coil, having the same number of convolutions, has several times the length of resistance strip and therefore several times the total resistance of the plain coil. While the folds of the zigzag coil cross one another and may be in close contact, the oxide on the metal is a sufficient insulator to prevent short-circuiting, the difference of potential between contacting folds, when current is passing through the coil, being very small. Where straight resistors are desired instead of coiled ones, it will be evident that the flattened zigzag strip of Figs. 4 and 5 may be used.

Instead of flattening the helical tube and then coiling the flattened resistor on edge, a suitable length of the helical tube *c'*, shown in Figs. 2 and 3, may be coiled closely around a core bar *4* to form a tubular coil *c³*, as shown in Fig. 8, and by then applying pressure to the ends of this coil, as illustrated in Fig. 9, its convolutions may be flattened into the form shown in Figs. 1, 6 and 7. In Patent to G. H. Whittingham 1,630,912, dated May 31, 1927, is shown a mechanism for coiling metal strips on edge and a similar mechanism may be adapted, with suitable modifications, to coiling the helical tube and flattening its convolutions. For the purpose of illustration, there is shown in Figs. 8 and 9 a core bar *4* having a face plate *5* secured thereto near one end. This core bar may be rotated by a motor *6* through gearing, not shown, and feed screws *7* may also be operated simultaneously by the motor to move a cross head *8* on guide rails *9* in the same way that a slide rest is moved in a lathe. By moving the cross head into a position close to the face plate and

passing one end of a helical tube *c'*, like that shown in Figs. 2 and 3, through a guide tube 10 on the cross head and attaching said end to the face plate, and then starting the motor, the cross head 5 will move away from the face plate and the tube will be coiled upon the core bar, as illustrated in Fig. 8. Then, while the motor is stopped, the cross head may be disconnected from the feed screws, as is done with the ordinary slide rest, 10 and the cross head may be moved back toward the face plate to compress the tubular coil and flatten its convolutions, as shown at *c* in Fig. 9 and also as shown in Figs. 1, 6 and 7. The mechanism shown is only for the purpose of illustrating the method. If desired, the core bar might be 15 de-clutched from the driving mechanism after the tubular coil has been wound upon it, and the feed screws could then be operated to move the cross head in either direction independently 20 of the core bar to compress the coil and back

the cross head off of the bar to release the flattened coil, instead of releasing the cross head from the feed screws and moving it independently. Various means may be devised for flattening and coiling the helically wound tube of Fig. 2 and I do 5 not limit myself to any particular means for accomplishing this result. It will be evident also that the helically coiled tube of Fig. 2, when flattened before coiling, as shown in Figs. 4 and 5, 10 may be used as a straight resistor element where such is desired.

What I claim is:

The method of making a flat resistor which comprises winding a ribbon of resistance metal 15 helically into the form of a tube, coiling the tube into the form of a helix and then applying pressure to the ends of said helix to flatten its convolutions.

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