July 10, 1951 A. NOYES, JR 2,559,988

TERMINAL STRUCTURE FOR COIL FORMS

Filed June 30, 1948

Fig. 1.

Fig. 2.

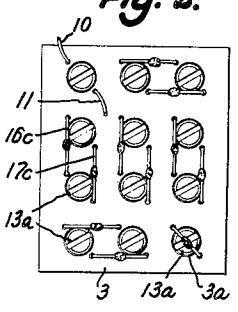


Fig. 3.

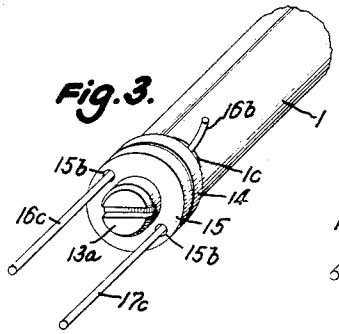


Fig. 4.

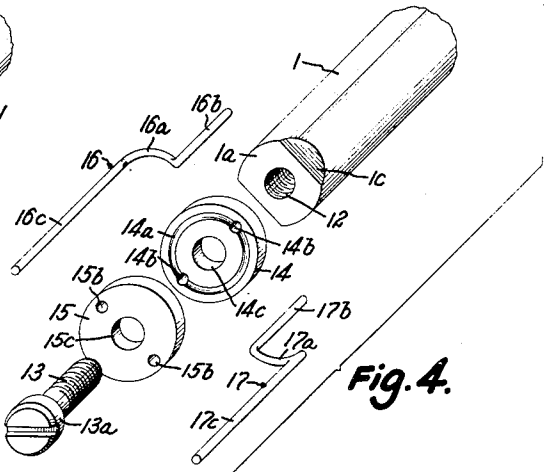


Fig. 5.

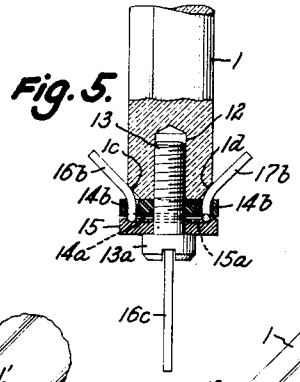


Fig. 8.

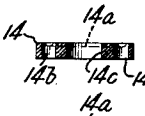


Fig. 9.

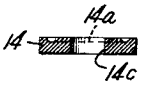


Fig. 6.

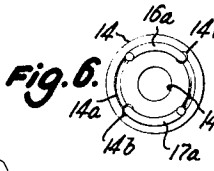


Fig. 7.

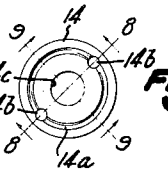


Fig. 10.

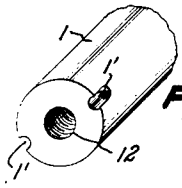
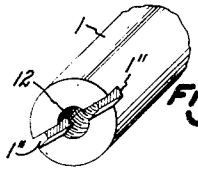


Fig. 11.



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Patented July 10, 1951

2,559,988

UNITED STATES PATENT OFFICE

2,559,988

TERMINAL STRUCTURE FOR COIL FORMS

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Application June 30, 1948, Serial No. 36,081

10 Claims. (Cl. 173—324)

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This invention relates in general to electrical coils and in particular to an improved construction for a combined coil form and lead-off assembly for the terminal ends of the coil.

In the past, considerable difficulty has been experienced in providing a satisfactory anchor and lead-off for the terminal ends of the coil, and the problem has been especially difficult where the form and coils are of small diameter i. e. of the order of one-fourth of an inch or less and a multiplicity of leads are taken out at the same end of the form. Ceramic coil forms have the advantage of permanence of dimensions with age and under conditions of high humidity, temperature variations and the like, and they can readily be ground to very close diametral tolerances, but the characteristics of the material are such that the attachment of coil terminals in a satisfactory manner to the end or ends of ceramic coil forms has long been a problem.

Primary objects of this invention are to provide improved lead-off arrangements for form-mounted coils which have relatively few and different parts, are easily and quickly assembled, and which assure a rigid, fixed position of the lead-off conductors which makes accidental short-circuiting of the coil leads virtually impossible. Objects are to provide a coil form and lead-off assembly including two insulated terminals in each end of small diameter coil forms without materially increasing the effective diameter of the assembly, whereby a close mounting of a number of such assemblies in a compact array is made possible. Further objects are to provide coil terminals or lead-off assemblies of the type stated which may readily be mounted on the ends of ceramic rod coil forms.

Other objects and advantages of the improved construction will become more apparent from the following detailed description of a preferred embodiment of the invention and the accompanying drawings in which:

Fig. 1 is a side elevation showing an assembly of form-mounted coil units, each of which is constructed in accordance with the principles of the invention; Fig. 2 is an end view of the same; Fig. 3 is a fragmentary view in perspective of one of the coil forms showing the lead-off conductor assembly at one end of the form; Fig. 4 is an exploded view showing the various components of the assembly illustrated in Fig. 3; Fig. 5 is a fragmentary view of one of the coil forms, partly in section and partly in elevation with the lead-off conductors assembled; Fig. 6 is an end view at an intermediate stage in the

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assembly showing the inner, grooved clamping disc with the lead-off conductors in place; Fig. 7 is an end view of one of the clamping discs with the lead-off conductors removed; Figs. 8 and 9 are diametral sectional views taken on lines 8—8 and 9—9, respectively of Fig. 7; and Figs. 10 and 11 are fragmentary perspective views of rod coil forms having different constructions for anchoring the lead-off wires against displacement.

Referring now to the drawings, and in particular to Figs. 1 and 2, I have there illustrated a twelve unit group of form-mounted coils, there being four rows of wire wound forms in one direction and three rows in the other direction. The coil forms, designated by reference numeral 1, are held in spaced relation between mounting plates 2, 3 which in turn are received in grooves 4 in parallel spaced plates 5, 6 secured to opposite walls of a box 7.

In the illustrated embodiment, each of the forms 1 has two coils 8, 9 of insulated wire wound together upon it and the opposite ends of each coil 8a, 8b and 9a, 9b lie at opposite ends of the form. All twenty-four coils are electrically connected in series resulting in two leads 10, 11 by which the coil group can then be connected into the circuit for which it is intended.

As previously explained, the primary object of the present invention is to provide an improved lead-off arrangement for the ends 8a—8b and 9a—9b of the coils at the ends of the cylindrical forms 1, the Figs. 3–9 clearly illustrate the principal structural features upon which patentable novelty is predicated. As shown in these views, each end of the forms 1 is recessed and tapped at 12 to receive a screw 13 having a slotted cylindrical head 13a by which two lead-off conductors 16, 17 are secured tightly in place between a pair of insulating discs 14, 15 and upon the end of the form 1. The two leads 16, 17 which are identical are preferably made from comparatively stiff round wire and include intermediate, arcuate laterally offset portions 16a, 17a. The latter which lie in a plane perpendicular to the end portions 16b, 16c and 17b, 17c and extend through substantially 90° of arc are seated in a shallow circular groove 14a in one face of a circular inner clamping disc 14, i. e. the disc next to the end face 1a of the form, and the inner ends 16b, 17b of the two lead-off conductors pass through axially extending apertures 14b in the disc 14, it being noted that these two apertures are located 180° apart and are in radial alignment with the groove 14a in relation to the disc axis. Flats 1c, 1d spaced 180° apart are provided

at each end of the form 1, and when assembled, the inner ends 16b, 17b of the lead-off conductors lie flat against them so as to prevent any accidental turning of the lead-off conductors about the axis of the form.

The outer disc 15 is structurally identical with the inner disc 14 and the circular groove and apertures therein through which the outer ends 16c, 17c of the lead-off conductors are passed are identified by numerals 15a, 15b. The depth of the grooves 14a, 15a is made somewhat less than one half the diameter of the lead-off conductors 16, 17 so as to provide a good clamping action on the latter.

The manner of assembly is obvious from the exploded view in Fig. 4 in which all component parts have been oriented with respect to the axis of the form to the exact positions they occupy upon assembly. Referring to Fig. 4 it will be observed that the grooved surfaces of the discs 14, 15, confront each other and that their respective apertures 14b, 15b are displaced 90° with respect to the form axis. Hence when the components are assembled and screw 13 which passes through axial openings 14c, 15c in the discs is screwed into the end face 1a, the intermediate arcuate offset portions 16a, 17a of the two lead-off conductors will be clamped tightly between the discs 14, 15 in the co-registering grooves 14a, 15a; the inner ends 16b, 17b of the conductors will lie against the form flats 1c, 1d which lock the parts against rotation; and the outer ends 16c, 17c of the lead-off conductors will extend parallel to the form axis and 180° apart so as to provide a maximum spacing between the conductors.

As shown in Figs. 1 and 2, the inner ends 16b, 17b of the lead-off conductors are then soldered to the coil ends 8a, 8b and 9a, 9b, and the outer ends 16c, 17c of the adjacent coils interconnected by soldering at both ends of the twelve unit assembly to provide the desired series coil connection.

Finally it will also be observed from Figs. 1 and 2 that nothing additional in the way of structure is necessary for support of the coil forms 1 between the mounting plates 2, 3. The latter are provided with as many apertures 2a, 3a as there are forms to be supported, these apertures being so sized as to make a snug fit with the cylindrical heads 13a of the screws, and a pair of small openings are provided closely adjacent to each aperture 2a, 3a to pass the lead-off conductor ends 16c, 17c. It is often desirable, as shown in Fig. 1, to make the thickness of the mounting plates 2, 3 slightly in excess of that of the screw heads so that when assembled, the screw heads lie below the outer faces of the plates thereby to facilitate interconnections between the several coils and also to reduce the possibility of a short circuit between leads.

The coil forms 1 are preferably of ceramic material when dimensional and mechanical stability are important and, whether of ceramic or of other insulating material, means other than the flats 1c, 1d may be employed for preventing inadvertent angular displacement of the lead-off wires, for example short and shallow grooves 1' extending longitudinally in a diametrical plane at the ends of the coil forms 1 as illustrated in Fig. 10, or a short diametrically disposed slot or saw kerf 1'' as illustrated in Fig. 11.

In conclusion, I wish it to be understood that the specific structural embodiment of the lead-off arrangement for small sized form-supported windings which has been illustrated and described is but typical of the invention and that various modifications thereof may be preferred by others in this art but without, however, departing from the spirit and scope of the invention as expressed in the appended claims.

I claim:

1. A combined coil support and lead-off assembly comprising an elongated form adapted to receive the coil, a lead-off conductor having a lateral offset portion intermediate the terminal ends thereof, a pair of confronting discs at one end of said form each of which is provided with an aperture extending between the opposite faces thereof, said offset portion of said conductor being seated between the confronting faces of said discs with the terminal ends of said conductor extending through the disc apertures aligned therewith, and means securing said discs together and to the end of the said form thereby to clamp the offset portion of said conductor between said discs.

2. A combined coil support and lead-off assembly as defined in claim 1 wherein the end of said form is provided with a flat against which rests the inner terminal end of said lead-off conductor.

3. A combined coil support and lead-off assembly as defined in claim 1 wherein the end of the coil form is provided with a shallow longitudinally extending groove in which the inner end of the lead-off conductor is seated.

4. A combined coil support and lead-off assembly comprisng an elongated form adapted to receive the coil, a lead-off conductor having a lateral offset portion intermediate the terminal ends thereof, a pair of confronting discs at one end of said form each of which is provided with an aperture extending between the opposite faces thereof, said offset portion of said conductor being seated in co-registering grooves provided in the confronting faces of said discs with the terminal ends of said conductor extending through the disc apertures aligned therewith, and means securing said discs together and to the end of said form thereby to clamp the offset portion of said conductor between said discs.

5. A combined coil support and lead-off assembly comprising an elongated form adapted to receive the coil, a pair of lead-off conductors each of which is provided with a lateral offset portion intermediate the terminal ends thereof, a pair of confronting discs at one end of said form each of which is provided with a pair of spaced apertures extending between the opposite faces thereof, said offset portions of said conductors being seated in spaced relation between the confronting faces of said discs with the terminal ends thereof extending through an aperture in each disc aligned therewith, and means securing said discs together and to the end of said form thereby to clamp the offset portions of said conductors between said discs.

6. A combined coil support and lead-off assembly as recited in claim 6 wherein the end of the coil form is provided with a diametrically disposed slot, the terminal ends of the lead-off conductors being arranged in opposite sides of said slot.

7. A combined support and lead-off assembly for a coil comprising an elongated form adapted to receive the coil, a pair of lead-off conductors each of which includes an intermediate portion laterally offset from the terminal ends thereof, a pair of confronting discs arranged at one end of said form, said discs having co-registering grooves in their confronting faces and each including a pair of apertures spaced 180° apart extending from the groove to the opposite face, said discs

being disposed with the respective apertures therein in offset relation corresponding to the offset portions of said conductors, and said terminal ends of said conductors extending through said apertures with the offset portions thereof seated in said grooves, and means securing said discs together and to the end of said form thereby to clamp the conductor offset portions between said discs.

8. A combined coil support and lead-off assembly comprising an elongated form adapted to receive the coil, a pair of lead-off conductors each of which includes an intermediate arcuate portion extending through 90° laterally offset from the terminal ends thereof, a pair of confronting discs at one end of said form, said discs having co-registering circular grooves in their confronting faces and each including a pair of apertures spaced 180° apart extending from said groove to the opposite face, said discs being disposed with the respective pairs of apertures at right angles, and said terminal ends of said conductors extending through said apertures with the offset portions thereof seated in said grooves, and means securing said discs together and to the end of said form to thereby clamp the offset portions of said conductors between said discs.

9. A combined coil support and lead-off assembly comprising an elongated form adapted to receive a pair of coils the ends of each of which terminate at opposite ends of said form, and a lead-off assembly at each end of said support for the coil ends, each said assembly comprising a pair of lead-off conductors each of which includes an intermediate portion offset laterally from the terminal ends thereof, a pair of confronting discs each of which is provided with an aperture extending between the opposite faces thereof, the offset portions of said conductors being seated in spaced relation between the confronting faces of said discs with the terminal

ends of said conductors extending through the apertures in said discs aligned therewith, and means securing said discs together and to the end of said form thereby to clamp the offset portions of said conductors between said discs.

10. A combined coil support and lead-off assembly comprising a coil form, a pair of confronting insulating discs each having a central aperture and a second off-center aperture extending between the opposite faces thereof, a lead-off conductor having an intermediate lateral offset portion seated between the confronting faces of said discs with the end portions passing through the off-center apertures, and a clamping screw extending through the central apertures in said discs and threaded into the end face of said form for securing the offset portion of said lead-off conductor between said discs and also securing the latter to said form, the end of said form including means cooperative with said conductor for holding the latter and said discs in predetermined angular relation to said form.

ATHERTON NOYES, JR.

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Certificate of Correction

Patent No. 2,559,988 July 10, 1951

ATHERTON NOYES, JR.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 30, for "comprisng" read *comprising*; line 61, for the claim reference numeral "6" read *5*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of September, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.

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