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MULTIPLE COIL WOUND RESISTOR

Filed April 5, 1945

Fig. 1

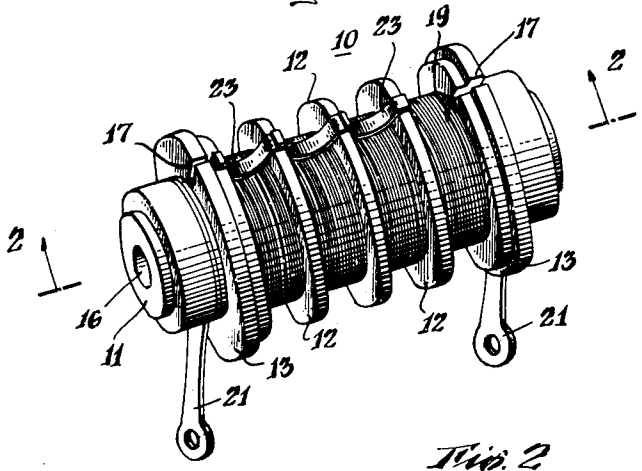
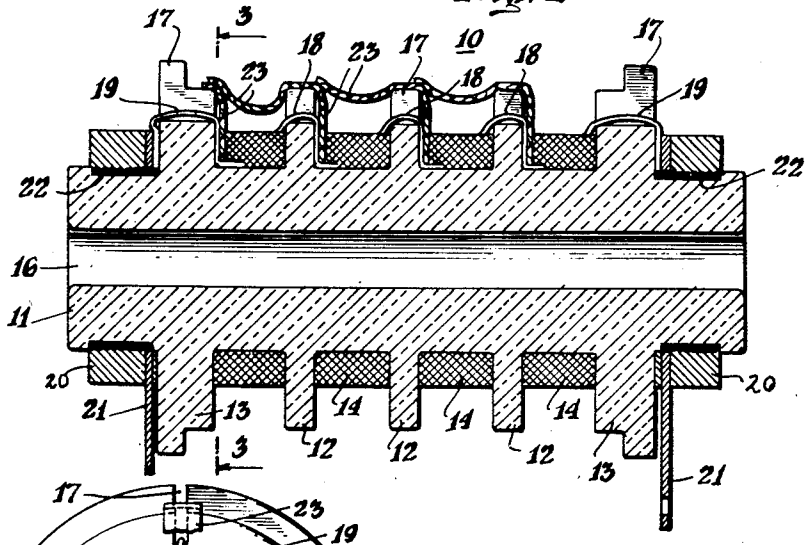


Fig. 2



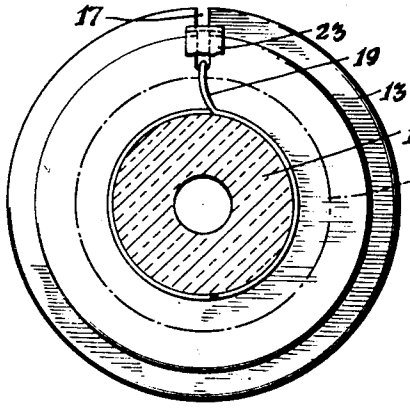


Fig. 3

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MULTIPLE COIL WOUND RESISTOR

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3 Claims. (Cl. 201—63)

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This invention relates to coil wound elements, particularly to an interconnected assembly of individual coil-wound impedance elements, and has for an object to protect the interconnecting leads between said individual elements.

In the manufacture of multi-coil impedance elements having a plurality of spools or coils which form integrated multi-ribbed spools, it has been the practice in wiring the entire element to run the wire from one terminal through a slot in a rib or flange forming a side of the spool, down the inner face of the flange, several turns being wound around a core to secure the lead-in wire in position and then winding the required number of turns on the core to form the usual coil. After the coil has been completed in the first spool, the wire is led through a similar slot in the adjacent flange for the second spool and the above winding process is repeated, etc., until all spools have been wound, after which the end of the wire is secured to its corresponding terminal.

It has been found that opens often occur in impedance elements manufactured in the above manner, particularly when the element is subjected to wide ranges of temperature, as well as humidity, and investigation has revealed that the opens generally appear in the leads interconnecting the adjacent spools. The investigation further reveals that the interconnecting leads upon completion of the winding operation are substantially taut even though sufficient slack in the wire was provided initially, the tautness of the wire being brought about by the fact that in winding a coil the various layers of wire contiguous to the interconnecting lead force it against the face of the flange, thereby taking up the slack. Furthermore, a certain amount of abrasive action is produced by the rubbing of the contiguous superposed coil wires against the interconnecting lead, so that the insulating medium therearound is partially removed at the contact area thereof, thereby encouraging deterioration, corrosion, and eventual breakage of the wire.

It is therefore another object of the invention to provide a simple and economical coil-wound impedance element free of the above manufacturing defects.

It is still another object of the invention to provide an improved coil-wound impedance element

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in which sufficient slack is assured for the lead-in and spool-interconnecting wires.

It is a further object of the invention to provide an improved coil-wound impedance element substantially impervious to humidity conditions.

With the above objects in view, one embodiment of the invention discloses a multi-spool coil form having a plurality of concatenated coils in which the lead-in and coil-interconnecting wires are assured a predetermined amount of slack by adhesively securing them to the inner spool flange surfaces, whereby these wires are also protected against abrasive contact by the superposed layers of wire.

A more complete understanding of this invention will be obtained from the detailed description which follows and by reference to the appended drawing in which:

Fig. 1 shows a perspective view of a multi-coil impedance element,

Fig. 2 shows an enlarged sectional view of the impedance element taken along line 2—2 of Fig. 1, and

Fig. 3 shows a sectional view of one of the coil forms taken along line 3—3 of Fig. 2.

Referring now to the drawing, particularly Figs. 1 and 2, there is shown an impedance element 10, such as a resistor of the multi-spool type, comprising a cylindrical core 11 with intermediate and outer flanges or walls 12, 13, respectively, integral thereto for forming the core 11 into a series of interconnected spools within each of which a wire-wound coil 14 is contained. The core 11, which may consist of any suitable insulating material, such as "Isolantite," may also be provided with an axial bore 16 for equipment-mounting purposes. Each of the flanges 12 and 13 is provided with a radial slot 17, transversely therethrough, the several slots preferably being in alignment. Radial slots 17 are provided in the inner flanges 12 for passage therethrough of the coil-interconnecting leads 18 while the radial slots 17 in the end flanges 13 are provided for the lead-in wires 19, which are connected to terminals 21 in a manner to be described hereinafter.

In manufacturing the impedance element in accordance with the invention, let it be assumed that the wiring, which may be insulated by any of the well-known insulating mediums, such as enamel, is initiated from the left side of the unit,

as viewed in Fig. 2. The lead-in wire 19 is first connected to terminal 21 by the usual soldered collar 20 which, briefly, comprises winding several turns of the lead-in wire in a recess 22 formed in the core and applying a collar of solder thereto, whereby the terminal 21 and turns of wire 19, which preferably are first tinned to facilitate the soldering operation, are electrically and mechanically interconnected. The lead-in wire 19 is then passed through slot 17 of flange 13 and down the inner face thereof to the peripheral surface of core 11. As shown in Fig. 2, the lead-in wire 19 is provided with a certain amount of slack, which is disposed within the slot 17. A few turns of the wire are then wound around the core a small distance away from the face of flange 13 to secure the wire in place, and the wire is then pushed back against the flange face to provide additional slack for the wire 19.

The next step comprises fastening the wire 19 to the side wall of the flange 13 by any suitable adhesive material, such as acetate tape 23, in a manner shown particularly in Figs. 2 and 3, the bulge of wire 19 in the slot 17 evidencing the approximate amount of slack. It can be readily seen that the adhesive tape 23 insures slack in the lead-in wire 19 and at the same time provides an additional insulating cover for the wire which is, therefore, protected from abrasions as the remaining turns of wire for the coil 14 are wound on the core 11. The required number of turns are then wound around the core 11 and the interconnecting lead 18 from the first coil 14 is then passed through the slot 17 formed in the adjacent inner flange 12, and the procedure of securing the wire 18 by tape 23 is repeated to provide the required amount of slack. It will be noted here that the adhesive tape 23 after being secured to the face of flange 12 is continued over the peripheral outer edge of flange 12, over the slot 17 formed therein, partially down the other face of the flange 12 and across to the adjacent flange 17, where it is adhesively secured to the top of the previously-secured tape 23. The above winding process is repeated for the remainder of the individual spools, after which the lead-in wire 19 for the extreme right spool 14, as viewed in Fig. 2, is connected to its terminal 21 in a similar manner to that at which the left lead-in wire 19 was connected to its terminal 21. Thus an impedance element comprising a series of interconnected coil windings is formed. The terminals 21 provide a suitable means for electrically connecting the impedance 10 to an external circuit (not shown).

The final step in the manufacturing process comprises dipping the impedance element 10 into any of the well-known impregnating materials, whereby the element 10 is further fortified against insulation resistance breakdown. By placing the tape 23 over the slots 17, as described hereinbefore, it has been found that the impregnated material remains within the slots after the dipping operation. In the prior manufacturing process the impregnating material did not adequately cover the wires 18, 19 in the slots 17, having dropped out of said slots 17 when the impedance element was removed from the impregnating compound. It is thus seen by virtue of the addition of the above tape 23 that a further advantage accrues to the manufacture of an improved impedance element 10 in accordance with this invention, namely, greater protection from an insulation resistance standpoint being provided for the interconnected and lead-in wires 18, 19, respectively, whereby the impedance element 10 may be employed under situations where wide ranges in temperature and humidity are encountered.

While this invention has been shown and described as embodying certain features merely for the purpose of illustration, it is clear to anyone skilled in the art that many modifications are possible without departing from the spirit of the invention and the scope of the appended claims. For example, while the invention has been described in connection with a multi-coil wound structure, it is, of course, to be understood that the invention may also be applied to a single coil wound impedance element.

Additionally, and also by way of example, it will be obvious to those skilled in the art that the advantages of the insulated tape as described above are equally applicable to resistors in which the flange between spools is not slotted, but, for example, flattened or notched, and the lead from one spool to the other passes up, over, and down the flange sides.

What is claimed is:

1. An impregnated impedance element comprising an insulating core, a plurality of spaced radially-extending flanges integrally formed on said core, each of said flanges having a radial slot therein, a plurality of turns of wire wound on said core to form individual coils between adjacent flanges, said coils being interconnected serially and being terminated in a pair of lead-in wires, said interconnecting and lead-in wires being extended through respective ones of said slots, a pair of terminals connected to said lead-in wires, and an adhesive insulating tape adherently applied to each flange over each lead-in wire so as to cover said wire and secure it to the side face of the associated flange, whereby a predetermined amount of slack is provided for said wires in said slots, each insulating tape also being disposed over the slot in the associated flange for preventing loss of impregnating material from the slot, extended across to the next adjacent flange and adherently secured to the tape on said flange.

2. The method of manufacturing an electrical impedance element of the wired-spool type having at least a pair of flanges and a radial slot in each of said flanges which comprises securing a wire to one end of the spool, passing the wire through one of the slots, securing the wire to the associated flange with a predetermined amount of slack provided within the slot by covering the slot and that portion of the wire extending therefrom along the flange with an adhesive element, winding a predetermined number of turns of wire around the spool, thereafter passing the wire through the slot of the other flange and securing the wire to the other end of the spool.

3. The method of manufacturing electrical impedance elements of the wired-spool type having a core and at least a pair of flanges with a radial slot in each of said flanges which comprises securing a wire to one end of the spool, passing the wire through the slot in one of the flanges, extending the wire to the core at an angle to the flange, winding at least two turns around the core adjacent said flange, pushing these turns against the face of the flange to provide slack in the wire in the slot, securing the wire to the flange by applying adhesive tape thereto, covering the slot with the same portion of tape, thereafter winding a predetermined number of turns of wire upon the core, extending the wire through

the slot of the other flange, and securing the wire to the other end of the spool.

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