United States Patent

Behn et al.

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[54] **FRONT CONTACTED ELECTRICAL COMPONENT**

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Related U.S. Application Data

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[52] **U.S. Cl.** **29/492,** 29/502, 29/570, 29/590, 29/628

[51] **Int. Cl.** **B23k 31/02**

[58] **Field of Search**.....29/492, 502, 628, 590, 570, 29/587

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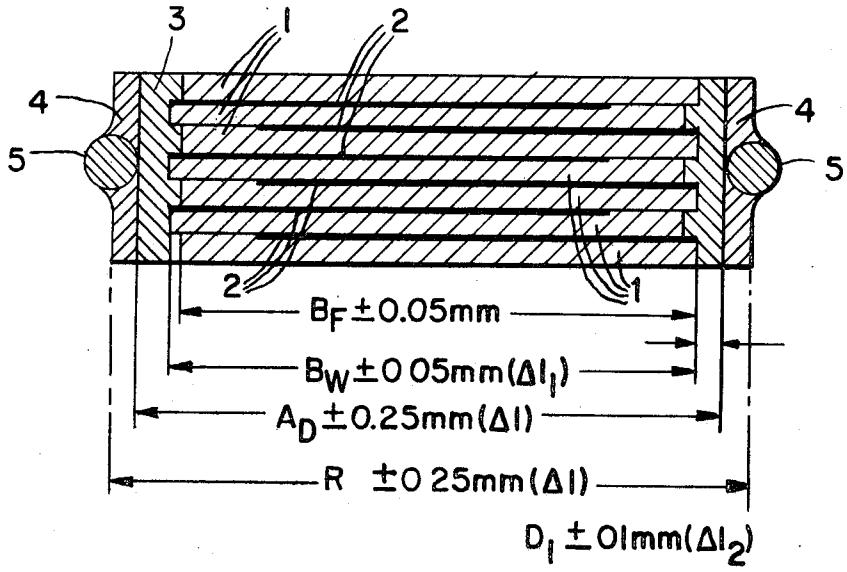
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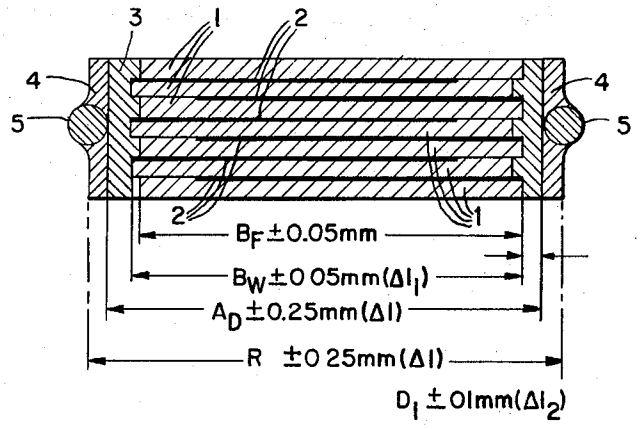
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[57] **ABSTRACT**

A pile or layer condensor is provided with external connecting wires on its two frontal sides by pressing the connecting wires into an outer metallic layer which has a lower melting point than an inner metallic layer which contacts the plates of the condensor. The connecting wires are thereby embraced by the outer layer and adhere to the inner layer.

4 Claims, 1 Drawing Figure




3
1
2
4
4
5
5
2
1
$B_F \pm 0.05mm$
$B_W \pm 0.05mm (\Delta l_1)$
$A_D \pm 0.25mm (\Delta l)$
$R \pm 0.25mm (\Delta l)$
$D_1 \pm 0.1mm (\Delta l_2)$

FRONT CONTACTED ELECTRICAL COMPONENT

This application is a division of Ser. No. 841,860, filed July 15, 1962, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to electrical components, and more particularly to the provision of connecting wires to such components.

2. Description of the Prior Art

Pile or layer condensors which are produced from a master condensor wound on a drum by dividing the master condensor in the radial direction and in the circumferential direction have what are termed frontal sides, which sides have a metallic layer applied thereto for commonly connecting the condensor plates of like plurality. Each condensor usually has two such frontal sides. Layer condensors and other electrical elements, such as resistances, are frequently installed into printed conductor plates in a vertical assembly. Holes are placed into the conductor plate with a standardized screen dimension and it is into these holes that the connecting wires are inserted and soldered during assembly of the particular circuit. The distance of the connecting wires at the building component may vary only in very definite limits due to the predetermined tolerance of the distance and diameters of holes. In order to maintain this screen dimension substantially constant, it is heretofore been a practice to provide space holders at the building element, for example, bottom platelets or cups with perforations. Alternatively, the distance is determined with the aid of a device when the wires are applied, for example with the aid of a gauge when the wires are soldered on. Moreover, in the known methods the distance can be adjusted during a pressing operation, or the distance is produced mechanically only prior to insertion into the conductor plate. These methods are complicated and difficult to perform, and in some cases entail considerable cost.

It is therefore highly desirable and a primary object of the present invention to provide techniques for maintaining the distance of the connecting wires of electrical components such as condensors and resistors initially within a certain tolerance.

SUMMARY OF THE INVENTION

According to the invention the distance of the external connecting wires of an electrical component is determined by applying a first contact layer to the component having a higher melting point than a second contact layer which is applied over the first contact layer. The contact wires are then pressed into the metal of the second contact layer whereupon they are embraced thereby and adhere to the first contact layer. Heat is applied to assist in forcing the connecting wires through the second or outer contact layer.

The foregoing shows a possibility of assuring the maintenance of the screen tolerance by the design of the electrical element itself. For example, a so-called layer, pile or stack condensor is actually fabricated in such a manner that partial pieces with the desired capacity are cutout of an annularly coiled body which is wound on a drum and contacted by means of metal spraying techniques which are known in art per se, two such metal layers being provided, one for each set of capacitor plates of like polarity. For resistors, two superposed metal layers would be provided where required for each terminal of the resistor.

BRIEF DESCRIPTION OF THE DRAWING

Other objects, features and advantages of the invention will be readily apparent from the following detailed description of a preferred embodiment thereof, taken in conjunction with the accompanying drawing, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure, and in which the single figure illustrates a stack or layer condensor having connecting wires provided according to the invention, the condensor being shown in cross-section.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As stated above, the present invention may be employed for a variety of electrical components. Inasmuch as the invention may be advantageously employed for layer type condensors, the description herein is directed to such condensors and the application of the invention to other components will be readily understood by those skilled in the art.

In contacting the electrical components, here a layer condensor, according to the invention, the preferred method comprises the provision of two superposed layers of metal for contacting the connecting wire. The outermost layer of metal is softened by heating and the connecting wire is pressed into the softened metal until it strikes and adheres to the inner metal layer. The inner metal layer has a higher melting point than the outer metal layer and melting of the inner layer is prevented by applying only sufficient heat and pressure to permit pressing of the connecting wire through the outer layer.

The inner layer which is employed for contacting the thin metal condensor plates and which has a high melting point is provided preferably as aluminum and/or copper and the outer contact layer employed for the application of the connecting wires is provided preferably from SnPb, white metal or babbitt metal **10**. The contacting of the connecting wires within the outer layer is best accomplished by bonding. By an appropriate dosification of the bonding energy, the connecting wires can be applied under radial connection such that they completely penetrate the low melting point outer metal layer and adhere to the high melting point inner metal layer, which must not be changed by the bonding energy, the surface of the inner layer which is adjacent and contacting the outer layer only adhering to the connecting wire. In this manner, the wire distance is determined. The total tolerance of the distance of both connecting wires results from the coiling precision of the master coil and from the thickness tolerance of the first contact layer which has the high melting point.

Referring to the drawing, a stack or layer capacitor is provided with connecting wires according to the present invention and includes metallic layers **2** carried by dielectricum foils **1** in a superposed construction. Alternate layers overlap on opposite sides of the condensor, the frontal sides, to which is applied a first metallic layer **3** having a high melting point, for example, aluminum and/or copper.

Second frontal metallic contact layers **4** are applied over the layers **3** from a metal having a lower melting point, for example. SnPb, white metal or babbitt metal **10**. The frontal layers **4** are softened by heating and the connecting wires **5** are pressed into the layers **4** and thereby bonded thereto. The connecting wires **5** are pressed into layer **4** until they contact the inner layer **3**, which through controlled application of heat is not softened due to its higher melting point. Thus, the overall wire diameter A_D and/or the screen dimension R can be maintained simply in all layer capacitors in a rather exact reproducability.

In a layer condensor as illustrated herein, the layers have a width B_F with a tolerance of ± 0.05mm. The foil width has no influence when determining the total tolerance $\Delta\ l$ but the winding width B_W does has such an influence. The latter is wider in view of the staggered arrangement of opposite pularity metallic layers **2** carried by the dielectricum layers **1**. The tolerance occuring at the winding width B_W is $l_1 = 0.05$ mm. Furthermore, the tolerance of the thickness of the first contact layer **3** is $\Delta l_2 = \pm 0.1$ mm which is also included in determining the total tolerance Δl. Consequently, for the overall wire distance A_D and/or for the screen dimension R of both the connecting wires the total tolerance may be stated by the expression

$\Delta l = \Delta l_1 + 2 \cdot \Delta l_2$. With the aid of appropriate means, the conditions of wire feed, quantity of gas passing through and the size of the spray cone for applying the layers can be maintained constant and thus the imprecision of the layer thickness Δl_2 can easily be maintained within ± 0.1 mm, so that for the wire distance $\Delta l = \pm 0.25$ mm results as the overall thickness.

Generally then there has been described techniques for securing connecting wires to electrical components whereby a highly precise arrangement of the connecting wires in accordance with the distance between the wires is achieved for aiding the application of such components as building blocks of electrical circuit assemblies.

What we claim is:

1. In a method of producing a frontally contacted electric layer capacitor from a parent capacitor of the type which has been wound on a drum, an improvement in attaching contact wires to the respective frontal surfaces and spaced at a predetermined distance, in particular the distance between holes in a printed circuit, comprising the steps of: spraying on each frontal surface a first layer of metal having a first melting point and simultaneously providing a thickness of the sprayed first layers so as to have external surfaces spaced equal to the predetermined distance; spraying on each first layer a second layer of metal having a second melting point lower than the first melting point; and heating to soften the second layers and pressing respective contact wires through the respective softened second layers to band the contact wires to the respective first layers without changing the first metal layers.

2. In an improvement as set forth in claim **1**, comprising the step of heating the second layers during the step of pressing without melting the first layers.

3. In an improvement as set forth in claim **2**, wherein the step of spraying first layers is further defined as spraying first layers of metal selected from the group consisting of copper, aluminum and alloys of copper and aluminum.

4. In an improvement as set forth in claim **3**, wherein the step of spraying second layers is further defined as spraying second layers of metal selected from the group consisting of SnPb, white metal and babbitt metal **10**.

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