United States Patent

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[54] **TERMINAL AND CORE ARRANGEMENT**
10 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** ..... **339/218 C, 339/263 R**
[51] **Int. Cl.** **H01r 9/16**
[50] **Field of Search** 339/263, 272, 218; 317/260

[56] **References Cited**

UNITED STATES PATENTS

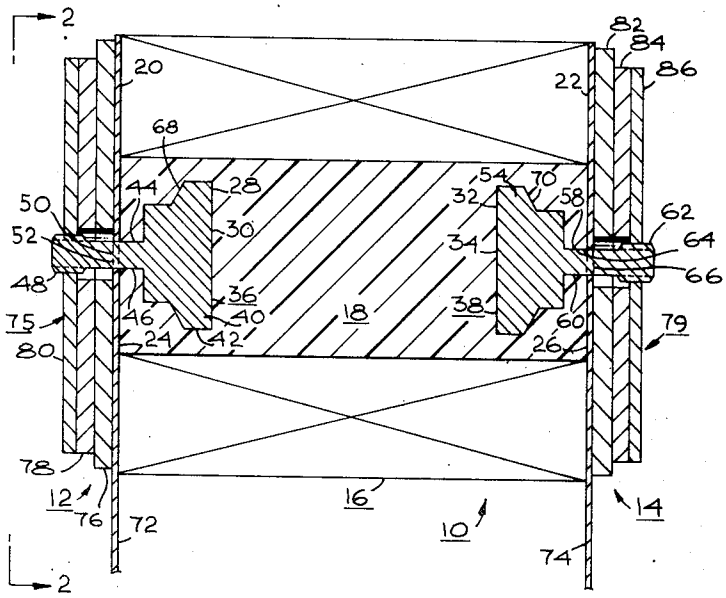
1,597,958	8/1926	Eby	339/272
1,794,289	2/1931	Haefely	317/260
1,821,803	9/1931	Haefely	317/260
1,852,718	4/1932	Haefely	317/260
3,398,340	8/1968	Geoghegan	317/260

FOREIGN PATENTS

1,518,847	2/1968	France	339/263 R

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ABSTRACT: An improved terminal connection arrangement for an electrical component is provided in which a core means extends throughout the length of the electrical component and has terminal members at each end surface. The terminal members have an attachment portion. These may be male or female threads. Each of the male-threaded portions has a lead-receiving aperture therethrough. A wirelike lead means is inserted in each of the lead-receiving apertures and a deformable washer such as a lead or soft copper washer is placed over the threaded end portion of the terminal member and a rigid washer is placed adjacent the deformable washer. A nut threadingly engages the threaded portion and clamps the rigid washer against the deformable washer thereby deforming the deformable washer and pressing the lead means tightly against the end surface of the electrical component to make electrical contact therewith to provide circuit continuity through the component. No soldering, welding, dipping or spraying is required and therefore a heatless terminal connection is achieved. In the female-threaded embodiment, any desired threaded insert may be installed.



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SHEET 1 OF 2

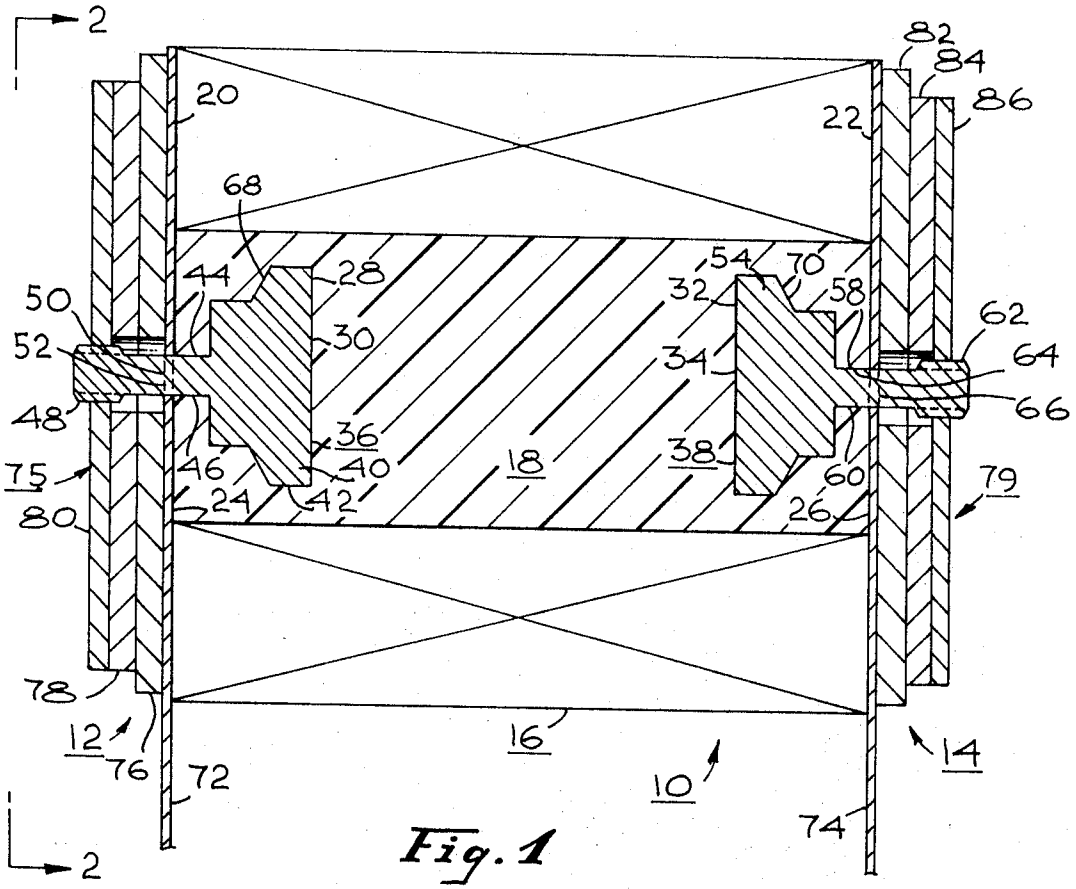


Fig. 1

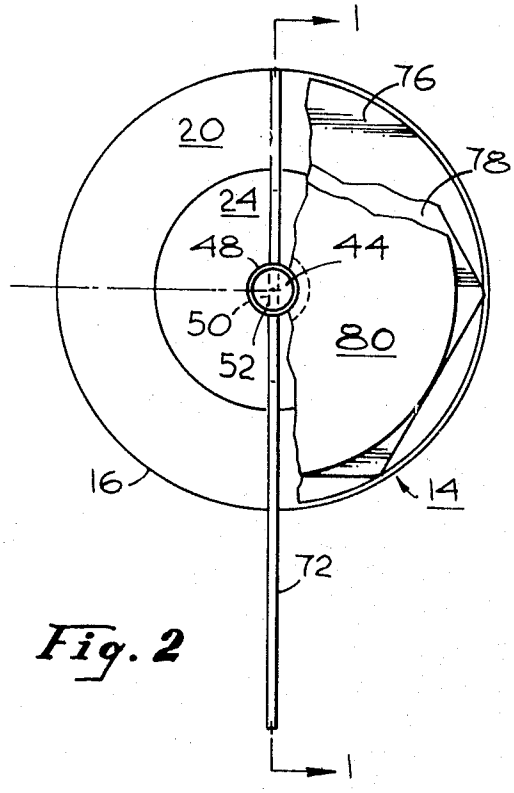


Fig. 2

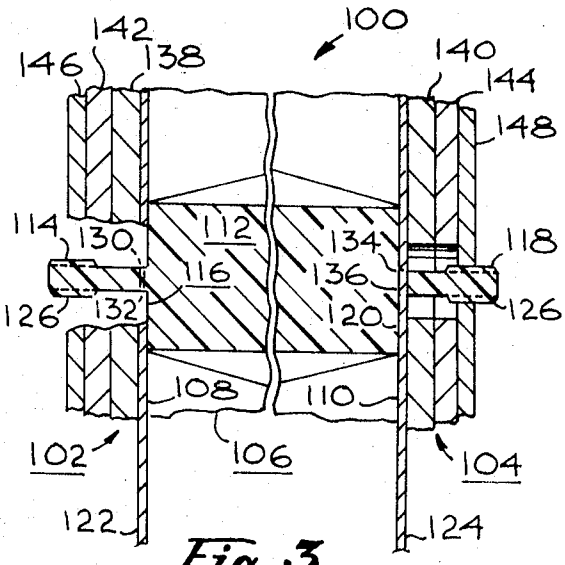


Fig. 3

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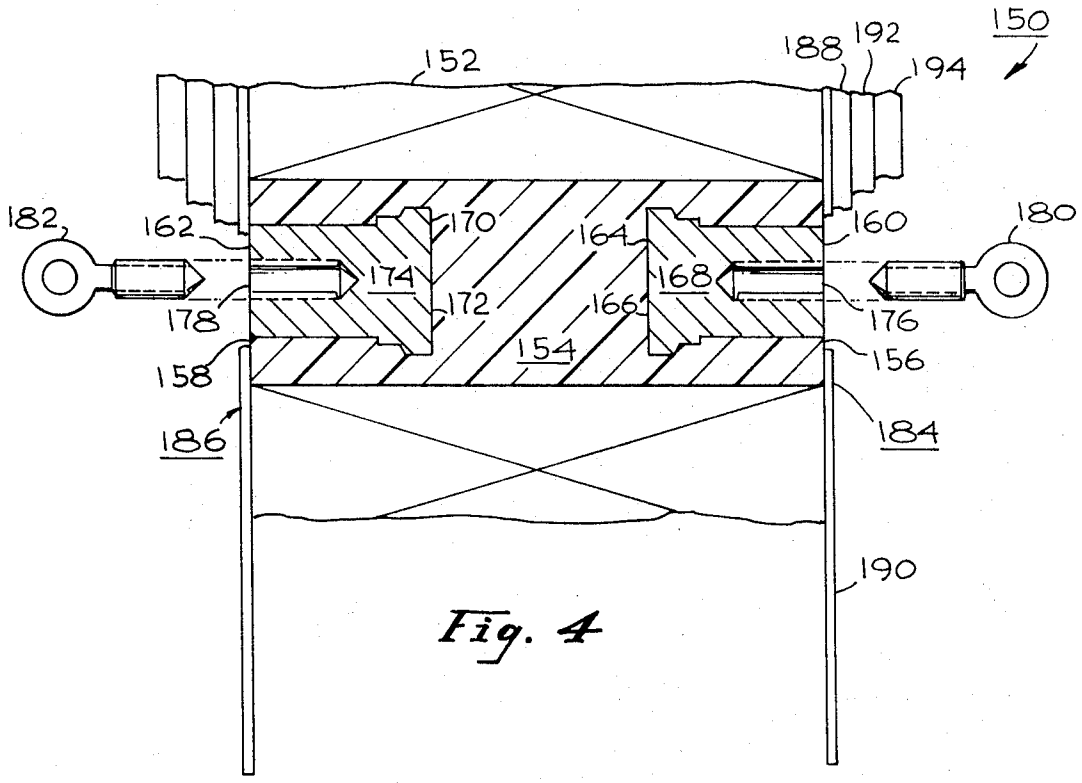


Fig. 4

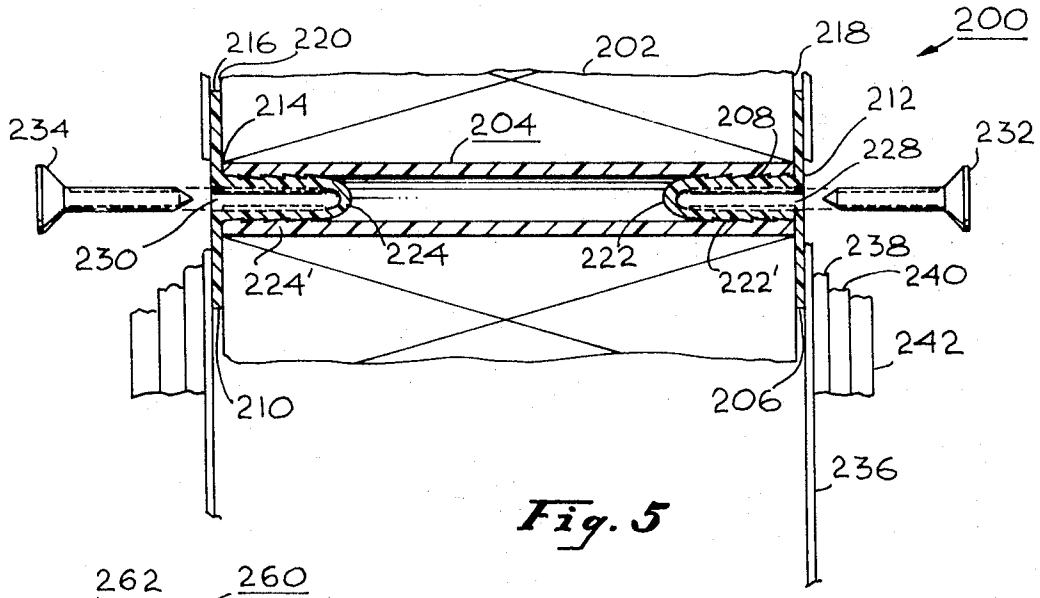


Fig. 5

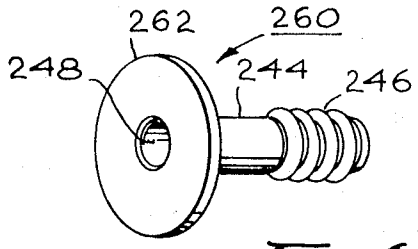


Fig. 6

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TERMINAL AND CORE ARRANGEMENT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the electrical component art and more particularly to an improved terminal connection arrangement for electrical components in which a good electrical contact is achieved without utilization of heat.

2. Description of the Prior Art

In many applications, such as miniaturized and microminiaturized electrical components, the reduced size of the component has made fabrication thereof difficult and, in particular, there has often been difficulty in providing a secure attachment of the leads to the electrical component.

Additionally, in many such electrical components it is often desirable that lead connections be coupled thereto without utilization of heat such as that arising out of solder spray, solder dipping, tack welding, or the like.

In applying the leads to small wound capacitors, in particular, it is desirable that good electrical connection be made between the lead and each winding comprising a capacitor plate. Since comparatively thin sheet, flexible dielectric material, upon which has been deposited an electrically conductive coating, is often utilized as material form which such wound capacitors are made, excess heat often disrupted good electrical contact between the lead and the comparatively thin, deposited electrically conductive coating comprising the capacitor plate.

SUMMARY OF THE INVENTION

Accordingly, it is an object of applicant's invention herein to provide an improved electrical component.

It is another object of applicant's invention herein to provide an improved lead attachment arrangement for an electrical component.

It is yet another object of applicant's invention herein to provide a structurally sound electrically conductive lead for an electrical component without utilization of heat or heat producing materials.

The above and other objects of applicant's invention are achieved, according to a preferred embodiment thereof, by providing an electrical component with a central core member extending from a first end surface of the electrical component through the component to a second end surface, spaced from the first surface. For example, the electrical component may be a wound capacitor and lead connections are to be made to a first plate of the capacitor at the first end surface of the component and to the second plate of the capacitor at the second end surface of the component.

The core member, which is dielectric, has in this embodiment, a first and a second molded-in-place terminal adjacent the ends of the core and each of the terminals has a body portion retained within the core and a neck portion extending through the core to regions external to the core and adjacent to the end surface of the component. The outermost portion of the neck portion is threaded and each neck portion has walls defining an aperture therethrough for receiving a thin wirelike lead.

The capacitor is wound upon the core with the molded-in-place terminals and when winding is completed, a first wirelike lead means is inserted through the aperture in the neck portion adjacent the first end surface of the component and second wirelike lead member is inserted through the aperture in the neck portion of the terminal adjacent the second end of the component. A first clamping means which may comprise a deformable washer, such as a soft lead, soft copper or the like that is, preferably, electrically conductive, placed over the neck portion and pressed against the end surface of the component, the core and the lead, a rigid washer placed over the neck portion immediately adjacent the deformable washer, and a nut threadingly engaging the threaded outermost portion of the neck portion of each terminal clamps the rigid washer against the deformable washer. This deforms the deformable washer for clamping the leads against the end surface of the component, thereby making good electrical contact with the windings of each capacitor plate.

In this embodiment of applicant's invention, of course, the molded-in-place terminals may be electrically conductive or dielectric. In other embodiments of applicant's invention, the core itself may be provided with the neck portions extending axially outwardly therefrom as part of a unitary structure and thereby eliminate the need for the molded-in-place terminals.

In other embodiments, a female threaded aperture is provided in the terminal for threadingly engaging suitable connection arrangements.

BRIEF DESCRIPTION OF THE DRAWING

The above and other embodiments of applicant's invention may be more fully understood from the following detailed description taken together with the accompanying drawings wherein similar reference numerals refer to similar elements throughout and in which:

FIGS. **1** and **2** illustrate one embodiment of applicant's invention;

FIG. **3** illustrates another embodiment of applicant's invention;

FIGS. **4** and **5** illustrate embodiments of applicant's invention having female terminal arrangement; and

FIG. **6** illustrates a connector useful in the practice of applicant's invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Before detailing a description of the preferred embodiments of applicant's invention herein, applicant wishes to point out that he has selected for utilization as an example of an electrical component, a wound capacitor. However, applicant's invention may equally well be utilized with any desired type of electrical component to provide the lead connections thereto to establish electrical continuity therethrough. Thus, applicant's invention is particularly useful in the fields of wound capacitors, wound resistors, and the like. Further, applicant's invention also finds particular utility in those electrical components where the use of heat such as that associated with conventional soldering, solder spraying, solder dipping, tack welding or the like may have deleterious effects upon the component.

Referring now to FIGS. **1** and **2** there is shown, in FIG. **1**, a sectional view, and in FIG. **2** and end view, of one embodiment of an electrical component **10** incorporating the structure of applicant's improved terminal connection arrangements **12** and **14**. As shown, the electrical component **10** may comprise an electrical body member **16** such as, for example, a wound capacitor that is wound upon a dielectric core **18**. As is well known in the capacitor art, connection to each plate comprising the capacitor is made of the end surfaces **20** and **22** of the component **10**.

The dielectric core means **18** extends from the first end **20** to the second end **22** and has end surfaces **24** and **26** substantially coplanar with the end surfaces **20** and **22**, respectively, of the body member **16**.

The dielectric core means **18** has first walls **28** defining a first terminal receiving cavity **30** adjacent the first end **24** thereof and second walls **32** defining a second terminal receiving cavity **34** adjacent the second end **26** thereof. A first terminal means **36** is in the cavity **30** and a second terminal means **38** is in the second terminal receiving cavity **34**.

In this embodiment of applicant's invention, both ends of the electrical component **10** have substantially identical terminal connection arrangements **12** and **14**.

The terminal means **36** and **38** may, for example, be molded in place in the dielectric core **18** and, therefore, may be dielectric or electrically conductive as desired for particular applications. The dielectric core may be any desired dielectric such as ceramic, plastic or the like.

The first terminal means 36 has a body member 40 retained in an interior portion 42 of the cavity 30 and a male neck portion 44 extending through a passageway 46 a preselected distance to regions external the end surface 24 of the core means 18 and first end 20 of the body member 16 of the component 10. An outermost portion 48 of the neck portion 44 is threaded and adjacent the first end 24 of the core means 18 the neck portion 44 has walls 50 defining a lead-receiving aperture 52 therethrough.

Similarly, the second terminal means 38 has a body portion 54 retained within an interior portion 56 of the cavity 34 and a male neck portion 58 extending through a passageway 60 in the core means 18 a preselected distance to regions external the second end 26 of the core means 18 and second end 22 of the body member 16 of the component 10. The outermost portion 62 of the neck portion 58 is threaded and the neck portion 62 has walls 64 defining a lead-receiving aperture 66 therethrough.

The first terminal means 36 and second terminal means 38 are restrained within the dielectric core means 18 by the shoulder portions 68 and 70, respectively, to prevent their being pulled out of the core 18.

After the capacitor is wound upon the dielectric core 18 to provide the component 16 it will be appreciated that during handling and storing thereof attachments may be made to the threaded portions 48 and 66 of the first terminal means 36 and second terminal means 38, respectively, such as a handle or other device, so that electrical component 16 may be conveniently handled, stored and/or tested during operation before installation of the leads thereto.

When it is desired to install the lead connections on the electrical component 10 a first wirelike lead means 72 is inserted through the aperture 52 in the neck portion 44 of the first terminal means 36 and a second wirelike lead means 74 is inserted through the aperture 66 in the neck portion 58 of the second terminal means 38 and the wirelike lead means 72 and 74 extend along the first end 20 and second end 22, respectively, of the body member 16 of the component 10 to provide an electrically conductive relationship thereto. Therefore, of course, the first lead means 72 and second lead means 74 are electrically conductive also.

A first clamping means 75 generally comprises a first deformable washerlike lead means 76 that is positioned on the neck portion 44 immediately adjacent the first wirelike lead means 72 and the deformable washerlike means 76 is preferably electrically conductive and may, for example, be of soft lead, soft copper, or the like. A first rigid washerlike means 78 is also positioned over the neck portion 44 and is adjacent the first deformable washerlike means 76. A first nut means 80 threadingly engages the threaded portion 48 of the neck portion 44 and is threaded against the rigid washer 78. This clamping action of the first clamping means 75 deforms the deformable washer 76 and forces it over the first wirelike lead means 72 and it and wirelike lead means 72 thereby make good electrical contact with the first end surface 20 of the body portion 16 of the electrical component 10, which, for example, may be the connection to the first plate of a wound capacitor comprising the electrical component 10.

As can be seen, it is preferred that the first deformable washerlike means 76, first rigid washerlike means 78 and nut 80 extend radially beyond the end surface 24 of the dielectric core means 18 to overlie first end surface 20 of the body member 16 of the electrical component 10 thus providing good clamping action of the deformable washer 16 and the first wirelike lead means 72 against the first end surface 20.

The second clamping means 79 is substantially identical to the first clamping means 75 and is comprised of a second deformable washerlike means 82 adjacent the second end surface 22 on the neck portion 58 of the second terminal means 38, a second rigid washerlike means 84 adjacent the second deformable washerlike means 82 and a second nut means 86 threadingly engaging the threaded portion 62 of the neck portion 58. This forces the second rigid washerlike means 84 to deform the second deformable washerlike means 82 against the second end surface 22 and second wirelike lead means 74 to provide good electrical contact. The second washerlike means 82 may, of course, also be fabricated from electrically conductive lead, copper, or the like.

Thus, it is seen, that there has been provided a terminal connection arrangement for good electrical contact and free of the deleterious effects that may be imposed upon the electrical component 10 by the use of heat associated with soldering, solder spraying, solder dipping, tack welding, or the like.

In FIG. 3 there is illustrated the structure associated with another embodiment of applicant's invention as utilized on an electrical component 100 in which there is provided a first lead connection arrangement 102 and second lead connection arrangement 104, similar to each other, in accordance with applicant's invention herein. The electrical component 100 has a body portion 106 which, for example, may also be a wound capacitor having a first end 108 and a second end 110 at which connections to the first and second capacitor plates comprising the wound capacitor body member 106 are to be made. A dielectric core means 112 is a unitary structure extending through the body member 106 and having a first neck portion 114 extending axially outwardly from the first end 116 of the core means 112 a preselected distance, and a second neck portion 118 extending axially outwardly a preselected distance from the second end 120 of the core means 112. The core means 112, of course, is dielectric to prevent shorting between the plates after attachment of the wirelike leads 122 and 124.

The neck portion 114 has a threaded portion 126 adjacent the outermost part thereof, and the neck portion 118 has a similar threaded portion 128 adjacent the outermost part thereof. The first neck portion 114 also has walls 130 defining a first lead-receiving aperture 132 through which the first wirelike lead means 122 extends. Similarly, the second neck portion 118 has walls 134 defining a second lead receiving aperture 136 therethrough through which the second wirelike lead means 124 extends.

First and second deformable washerlike means 138 and 140 which, for example, may be similar to the deformable washerlike means 76 and 82 described above, first and second rigid washerlike means 142 and 144 which, for example, may be similar to the first and second rigid washerlike means 78 and 84 described above, and first and second nut means 146 and, 148 which, for example, may be similar to first and second nut means 80 and 86 described above, are installed on the first and second neck portions 114 and 118, respectively, in the manner described above. This clamps the first deformable washerlike means 138 against the electrically conductive first lead means 122 and first end 108 of the body member 106 to provide electrical contact relationship to the first capacitor plate. Similarly, the second deformable washer 140 is clamped against the second wirelike lead means 124 and second end 110 of the body member 106 to provide good electrical contact relationship with the second capacitor plate.

Similar construction can be utilized for electrical components other than wound capacitors, of course, to provide a heatless terminal connection arrangement in accordance with applicant's invention.

It will be appreciated that the cores utilized in applicant's invention may be either the unitary type such as core means 112 tubular with a continuous terminal therethrough or have molded-in-place terminals such as that shown in FIGS. 1 and 2.

As described above, the embodiments of applicant's invention shown in FIGS. 1, 2, and 3 have generally comprised electrical components in which the threaded portion of the terminals were male-threaded members. That is, they extend outwardly from the end surface of the terminal. Applicant's invention herein any equally well be provided with female-threaded members for appropriate utilization as desired.

FIG. 4 illustrates one embodiment of an electrical component generally designated 150. The electrical component

150 comprises an electrical body member 152 which may, for example, be a wound capacitor, wound upon a dielectric core member 154. In this embodiment of applicant's invention, the dielectric core member 154 is for example, a ceramic. As is well known in the capacitor art, connection to each plate comprising the capacitor is made at the end surface 156 and 158 thereof.

The core means 154 extends from the first end surface 156 to the second end surface 158 and has end surfaces 160 and 162, substantially coplanar with the end surfaces 156 and 158 of the electrical component 152.

Dielectric core means 154 has first walls 164 defining first terminal receiving cavity 166 adjacent the first end 160 thereof. A first terminal means 168 is molded in place in the cavity 166 of the core 154. Similarly, the dielectric core 154 has second walls 170 defining a second terminal receiving cavity 172 in which there is a second terminal means 174 molded in place, since the core means 154 is dielectric, the first terminal 168 and second terminal 174 may be dielectric of electrically conductive as desired in this embodiment of applicant's invention.

The first terminal means 168 is provided with a first threaded aperture 176 therein and the second terminal means 174 is provided with a second threaded aperture 178 therein. It will be appreciated that each of the first terminal means 168 and second terminal means 174 are restrained within the dielectric core 154 in a manner similar to that shown in FIGS. 1 and 2 and as described above.

A first threaded member 180 is adapted to be threaded engaged in the threads of the first threaded aperture 176 and, similarly, a second threaded member 182 is adapted to be threadingly engaged with the threads of the second threaded aperture 178. In this embodiment of applicant's invention both the first end 156 and the second end 158 of the electrical compound 152 are substantially identical and clamping arrangements 184 and 186 are provided at these ends, respectively. Accordingly, in structures similar to that described above, there may be provided a first deformable washerlike lead means 190, a first rigid washer means 192 and, if desired, a first nut means 194, acting as a locknut. Thus the clamping means 184 provides a good electrical connection to the end surface in 156 of the electrical component 152. The clamping arrangement 186 on the second end 158 of the electrical component 152 is substantially identical thereto.

In FIG. 5 there is shown another embodiment of applicant's invention generally designated 200 in which there is provided a flexible, tubular, resilient dielectric core means 204 upon which the electrical component 202 which, for example, may be a wound electrical capacitor, is wound. A first insert 206 is inserted in the first end 208 of the tubular dielectric core means 204 and a second insert 210 is inserted in the second end 212 of the tubular dielectric core 204. Each of the first insert 206 and second insert 210 have similar flange portions 212 and 216, respectively, that are adjacent the end surfaces 218 and 220 of the electrical component 202 respectively. Similarly, each of the inserts 206 and 210 have body portions 222 and 224 extending into the tubular dielectric core means 204 a preselected distance and are provided with roughened exterior walls 222' and 224' for frictional retention engagement with the interior wall surface 226 of the tubular dielectric core means 204.

The insert 206 has a threaded aperture 228 therein and the insert 210 has a threaded aperture 230 therein for receiving, respectively, threaded members 232 and 234, respectively, to provide clamping arrangements at each end thereof. Such clamping arrangements may be similar to described above and may comprise a flexible wirelike lead 236, deformable washerlike means 238, a rigid washer 240 and, if desired, a nut means 242 acting as a locknut. The second end 216 may be similar. Thus, this embodiment in applicant's invention as shown in FIG. 5 may be utilized on any type of electrical component having a core means in which the inserts may be properly retained.

FIG. 6 illustrates an insert generally designated 260 that may be useful in the practice of applicant's invention herein. As shown, the insert 260 has a flange portion 262 and a body portion 244. The body portion 244 has, in this embodiment of applicant's invention roughened exterior wall portions 246 on the body portion 244 for frictional and mechanical engagement with the interior wall surfaces of a flexible, resilient, dielectric core means such as that shown in FIG. 5. However, this insert 260 has an aperture 248 therein that is not threaded but is smooth walled to receive a typical "banana" type connector. Thus, when utilizing inserts such as insert 260 a wirelike lead means, a deformable washer, a rigid washer and a nut means need not be utilized. Alternatively, an insert similar to insert 260 shown in FIG. 6 may have a body portion with external threads for threading engagement with the insert such as insert 206 or 208 shown in FIG. 5 to provide the "-banana" connecting aperture therein in place of the threaded members 232 and 234.

This concludes the description of applicant's invention of his improved terminal connection arrangement for electrical components in which good electrical contact relationship is made for circuit continuity to the electrical component without utilization of heat in forming the terminal connection.

It will be appreciated that those skilled in the art may make many variations and adaptations of applicant's invention without departing from the true scope and spirit of applicant's invention.

What is desired to be secured by Letters Patent of the United States is:

1. An improved terminal connection arrangement for an electrical component of the type having a dielectric core means extending from a first end surface of the electrical component to a second end surface of the electrical component, spaced from the first end surface thereof, and comprising, in combination:

a dielectric core means comprising:

a first end surface adjacent the first end surface of the electrical component;

a second end surface adjacent and second end surface of the electrical component and spaced from said first end surface of said dielectric core means;

first walls defining a first terminal-receiving cavity adjacent said second end surface thereof;

second walls defining a second terminal-receiving cavity adjacent said second end surface thereof;

and said first terminal-receiving cavity having an interior portion and a passageway portion extending from said interior portion thereof to provide communication between said interior portion and regions external said core means adjacent said first end surface;

and said second terminal-receiving cavity having an interior portion and a passageway portion extending from said interior portion thereof to provide communication between said interior portion and regions external said core means adjacent said second end surface;

first terminal means having a body portion in said first terminal-receiving cavity and an attachment portion, said attachment portion comprising:

a neck portion extending through said passageway portion of a preselected distance from said first end surface of said core means, and said neck portion having:

first walls defining an aperture therethrough; and

second walls, external said first terminal receiving cavity, defining a threaded portion thereof;

second terminal means having a body portion in said second terminal-receiving cavity and an attachment portion, said attachment portion comprising:

a neck portion extending through said passageway portion a preselected distance from said second end surface of said core means, and said neck portion having:

first walls defining an aperture therethrough; and

second walls, external said second terminal receiving cavity, defining a threaded portion thereof;

first wirelike lead means having a first end portion extending through said aperture in said first terminal means and adjacent said first end of said core and adjacent the first end of the electrical component and in electrically conductive relationship thereto, and a second end portion spaced from said first end portion thereof;

second wirelike lead means having a first end portion extending through said aperture in said second terminal means adjacent said second end of said core means and adjacent the second end of the electrical component and in electrically conductive relationship thereto, and a second end portion spaced from said first end portion thereof;

first clamping means for clamping said first lead means in said electrically conductive relationship to the first end surface of the electrical component, and said first clamping means comprising:

a first deformable electrically conductive washerlike means mounted on said neck portion of said first terminal means immediately adjacent the first end surface of the electrical component and immediately adjacent said first end portion of said first lead means;

a first rigid washerlike means mounted on said neck portion of said terminal means and adjacent said first deformable washerlike means; and

a first nutlike means threadingly engaging said threaded portion of said neck portion of said first terminal means for clamping said first rigid washerlike means against said first deformable washerlike means to deform said deformable washerlike means against said first end portion of said first lead means and the first end of the electrical component;

second clamping means for clamping said second lead means in said electrically conductive relationship to the second end surface of the electrical component, and said second clamping means comprising:

a second deformable electrically conductive washerlike means mounted on said neck portion of said second terminal means immediately adjacent the second end surface of the electrical component and immediately adjacent said first end portion of said second lead means;

a second rigid washerlike means mounted on said neck portion of said second terminal means adjacent said second deformable washerlike means; and

a second nutlike means threadingly engaging said threaded portion of said neck portion of said second terminal means for clamping said second rigid washerlike means against said second deformable washerlike means to deform said second deformable washerlike means against said first end portion of said second lead means and the second end of the component;

first restraining means for restraining said first terminal means in said first terminal-receiving cavity; and

second restraining means for restraining said second terminal means in said second terminal receiving cavity.

2. The arrangement defined in claim 1 wherein:

said first and second terminal means are electrically conductive.

3. The arrangement defined in claim 1 wherein:

said first and said second terminal means are dielectric.

4. The arrangement defined in claim 1 wherein:

said first and second terminal means are molded in place in said dielectric core means.

5. The arrangement defined in claim 1 wherein:

each of said first deformable electrically conductive washerlike means and said second electrically conductive washerlike means are copper.

6. The arrangement defined in claim 1 wherein:

each of said first deformable electrically conductive washerlike means and said second deformable electrically conductive washerlike means are lead.

7. The arrangement defined in claim 1 wherein:

said aperture in said second terminal means is adjacent said second end surface of said core means.

8. The arrangement defined in claim 1 wherein:

said first restraining means comprises a shoulder portion on said first terminal means; and

said second restraining means comprises a shoulder portion on said second terminal means.

9. The arrangement defined in claim 1 wherein:

each of said first deformable electrically conductive washerlike means and said first rigid washerlike means have first walls defining apertures therethrough and said first walls spaced from said neck portion of said first terminal means; conductive washerlike means and said second rigid washerlike means have first walls defining apertures therethrough and said first walls spaced from said neck portion of said second terminal means.

10. The arrangement defined in claim 9 wherein:

each of said first deformable electrically conductive washerlike means and said first rigid washerlike means have portions thereof overlying preselected portions of the first end surface of the electrical component; and

each of said second deformable electrically conductive washerlike means and said second rigid washerlike means have portions thereof overlying preselected portions of the second end surface of the electrical component.

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