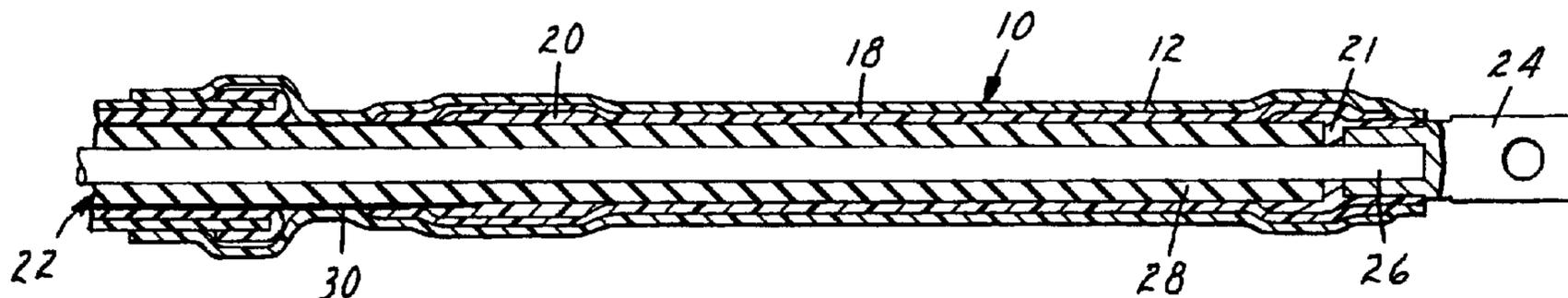




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 (54) Title: STRESS CONTROL FOR TERMINATION OF A HIGH VOLTAGE CABLE



(57) **Abrégé/Abstract:**

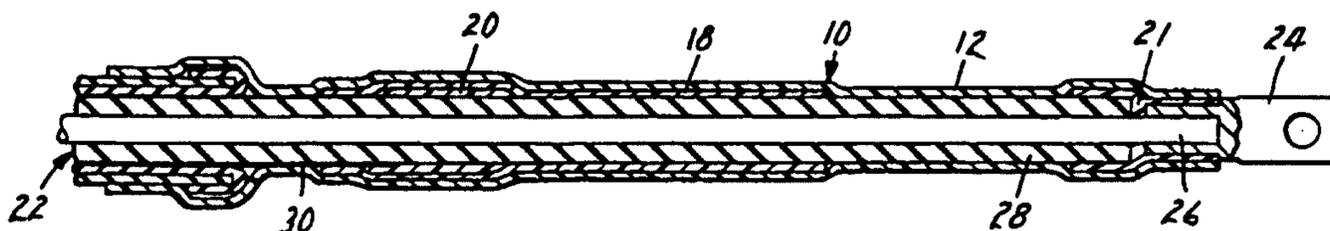
A two-part system for electrical stress control includes a conformable stress control material (20) positioned at the shield cut edge of a prepared power cable (22) and a stress control tube (18) over the conformable stress control material (20). A second region of conformable stress control material (21) is positioned adjacent the cut end of the insulation (28). Relationships are revealed which relate the permittivity and dimensional parameters of the two components.

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(54) Title: STRESS CONTROL FOR TERMINATION OF A HIGH VOLTAGE CABLE



(57) Abstract

A two-part system for electrical stress control includes a conformable stress control material (20) positioned at the shield cut edge of a prepared power cable (22) and a stress control tube (18) over the conformable stress control material (20). A second region of conformable stress control material (21) is positioned adjacent the cut end of the insulation (28). Relationships are revealed which relate the permittivity and dimensional parameters of the two components.

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1 Stress Control For Termination Of A High Voltage Cable

2

3 Field of the Invention

4

5 The present invention relates to electrical stress
6 control and more particularly to a method and an
7 arrangement to control electrical stress in a region of
8 high electric field strength associated with high
9 voltage electrical equipment.

10

11 Background of the Invention

12

13 It is well known to employ stress control means to
14 control electrical stress in a region of high
15 electrical field strength due to a shield discontinuity
16 in high voltage cable or electrical equipment, for
17 example, electrical bushings, and joints or
18 terminations of high voltage cables. Such stress
19 control means typically comprise stress cones and tapes
20 or tubular articles of semi-conductive stress control
21 material. This invention is directed to stress control
22 means comprising high permittivity stress control
23 material and provides improved corona discharge
24 extinction, power frequency voltage withstand and
25 impulse voltage withstand performance over prior art
26 arrangements using such stress control means. For
27 purposes of illustration, this invention is described
28 primarily as it applies to a termination of a high
29 voltage cable. The invention can be applied, however,
30 to other electrical cable or equipment where stress
31 control is desired.

32 A typical high voltage cable includes an inner
33 conductor surrounded by a conductor shield which is, in
34 turn, surrounded by an insulating material that is

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shield, in some instances, and metal shield. In terminating such a cable, it is customary to remove or cut back each successive layer of the cable to expose the layer below. Cutting back the electrically semi-
5 conductive shield causes a discontinuity in the electric field resulting in high electric stress at the end of the shield. The high electrical stress can cause electrical discharges to occur, which in turn tend to cause breakdown of the insulation of the cable.
10 The high electrical stress can be controlled by electrical stress control means.

High-voltage alternating current cable terminations are generally tested in the U.S. under the IEEE standard test procedure Std. 48-1990. This
15 procedure sets forth, inter alia, design tests to be performed by the manufacturer to obtain information on the performance of a high voltage cable termination.

The design tests of the IEEE procedure that are particularly useful in determining the effectiveness of
20 a termination which includes a stress control arrangement include the "Partial Discharge (Corona) Extinction Voltage Test," the "Power Frequency Voltage Withstand Test" and the "Lightning Impulse Voltage Withstand Test." In the discharge extinction voltage
25 test, electrical discharge in the termination is measured at specific applied voltages and has to be below specific values. Also the voltage at which the discharge extinguishes is measured and has to be above specific values. In the power frequency voltage
30 withstand tests the specified voltage is applied to the cable and should be withstood without flashover or other dielectric breakdown. In the impulse voltage withstand test, impulses of specific value and waveform are applied to the cable and should be withstood
35 without flashover or other dielectric breakdown. The voltage at which flashover occurs should be above specific values. The discharge, power frequency voltage and impulse voltage performance of the

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termination should meet the requirements set forth in the IEEE Standard Test procedures STD 48-1990.

The use of stress control material in high voltage cable terminations does not always produce terminations that meet the impulse performance requirements of the IEEE test procedures. In order to meet this requirement the stress control arrangement may be augmented by the use of rain sheds. While sheds are typically employed with outdoor terminations for other purposes, they are not generally employed when the cable termination is installed indoors. Since the use of sheds adds to the cost of the termination and requires additional space around the cable, it is desirable to be able to dispense with the use of the sheds yet still meet the desired impulse performance.

The present invention, provides a novel arrangement that significantly improves the termination's discharge, power frequency voltage and impulse voltage performance with or without the use of sheds. While the present invention is primarily described in connection with a termination of a cable, it is suitable for employment with high voltage cable joints and other high voltage equipment including electrical bushings and feedthroughs.

25

Summary of the Invention

The present invention includes an elastically recoverable elastomeric insulating sleeve which is provided with an inner support or "core" which holds the sleeve in a stretched condition. The sleeve is placed over the power cable and the core is unwound and removed, allowing the sleeve to contract into contact with the cable. Between the sleeve and the core is disposed a two-part stress control system consisting of a non-tacky, void-filling conformable stress control material surrounded by an elastomeric stress control tube. Both the conformable stress control material and

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the stress control tube have high permittivity (greater than 10). "Permittivity" is synonymous with dielectric constant and is the ratio of electric flux generated by an electrical field in a medium to that generated by the field in a vacuum.

The present invention defines relationships among the permittivities of the conformable stress control material and the stress control tube, the thicknesses of both members, and the length the conformable stress control material extends from the edge of the semi-conductive shield layer of the cable.

In a first embodiment of the invention, conformable stress control material is disposed in contact with the cut end of the cable shield and extends along the cable insulation. In a second embodiment of the invention, a conformable stress control material is also in contact with the cut end of the cable insulation and lug.

There is also provided the termination for an electrical power cable including an inner conductor, electrical insulation surrounding the conductor and a semi-conductive shield surrounding the insulation, wherein the shield is removed to a predetermined length and the insulation is removed to a lesser predetermined length to expose the conductor, the termination comprising: a first region of conformable stress control material having permittivity greater than 10 in contact with a cut end of the cable shield and extending along the cable insulation; a second region of conformable stress control material having permittivity greater than 10 disposed in contact with a cut end of the cable insulation; a polymeric stress control tube extending between said first and second regions of conformable stress control material; and a polymeric

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electrically insulating layer extending from a first end of the termination to a second end of the termination, the electrically insulating layer disposed over said first and second regions of conformable stress control material and
5 over said polymeric stress control tube.

Brief Description of the Drawings

The present invention will be described with respect to the accompanying drawings, wherein like numbers refer to like parts in the several views, and wherein:

10 Figure 1 is a cross-sectional view of a stress control termination sleeve of the present invention with rain sheds;

Figure 2 is a cross-sectional view of the stress control termination sleeve of the present invention without
15 rain sheds; and

Figure 3 is a cross-sectional view of the stress control termination sleeve of the present invention as applied to an electrical power cable.

20 Figure 4 is a cross-sectional view of an alternate embodiment of the stress control termination sleeve of the present invention as applied to an electrical power cable.

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Figure 5 is a cross-sectional view of yet another alternate embodiment of the stress control termination sleeve of the present invention as applied to an electrical power cable.

5

Description of the Preferred Embodiment

Figure 1 illustrates a termination assembly, generally indicated as 10, according to one embodiment of the present invention. The assembly 10 is a pre-stretched tubular sleeve 12 supported in the stretched condition by an easily removable core 14. The assembly 10 is typically designated a "PST", which stands for pre-stretched tube. Such an assembly 10 is taught in U.S. patent no. 3,515,798.

Preferably the core 14 is a one-piece rigid spiral core having interconnected adjacent coils in a closed helical configuration, as described in U.S. patent no. 3,515,798. The outer sleeve 12 is preferably silicone rubber, although a wide variety of materials may be used so long as they possess the required arc and track resistance, ultraviolet resistance and ability to stretch and recover substantially their original dimensions when the core 14 is removed.

The termination assembly of Figure 1 is primarily intended for outdoor use and so includes rain sheds 16 which increase the tracking length along the length of the sleeve 12. Space is usually more critical in indoor applications, so the rains sheds 16 are usually dispensed with in these situations, as shown in Figure 2. Either termination assembly 10 is applied as shown in Figure 3 to an electrical power cable 22 which has a suitable terminating device such as the lug 24 shown crimped to the conductor 26 of the cable 22.

To apply the lug 24 and thus terminate the cable 22, the cable 22 must be prepared by removing a predetermined length of insulation 28 covering the

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conductor 26 and a greater predetermined length of
 semi-conductive shielding 30 covering the insulation
 28. Cutting back the shield 30 causes a discontinuity
 in the electrical field surrounding the conductor 26
 5 which results in high electrical stresses an the end of
 the shield 30. The high stress can cause electrical
 discharge to occur, which in turn may cause breakdown
 of the insulation 28 of the cable 22 or the termination
 sleeve 12. The present invention is intended to
 10 control these high electrical stresses to avoid these
 undesirable results.

Electrical stress control in the preferred
 embodiment is provided in the termination 10 by the
 combined use of a high permitivity stress control tube
 15 18 lining a portion of the sleeve 12, and a conformable
 stress control material 20 within the stress control
 tube 18. The thicknesses of the stress control tube 18
 and the conformable stress control material 20, the
 length of the conformable stress control material 20
 20 and the permitivity of both the stress control tube 18
 and the conformable stress control material 20 are
 controlled to accomplish the desired stress control
 within the termination assembly 10.

The high permitivity stress control tube 18 is
 25 described generally in U.S. patent number 4,363,842.
 The article taught in that patent has been modified
 somewhat to produce the preferred stress control
 tube 18 defined by the following composition:

30

Parts by Weight	
Nordel 1470 (Tradename for an ethylene/propylene/diene monomer rubber commercially available from Dupont)	50

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Nordel 1440 (Tradename for an ethylene/propylene/diene monomer rubber commercially available from Dupont)	50
Zinc oxide (French Process)	5.0
ARO60 Carbon Black (a N754 grade, large particle size carbon black commercially available from J.M. Huber)	71.35
4X Mineralite Mica (commercially available from Thompson Hayward Chemical)	20
D-148 (Tradename for a processing aid commercially available from Ventron)	2.0
Struktol WB-16 (Tradename for a mixture of fatty acid soap, predominantly calcium, available from Struktol Company)	2.0
EF (A-172) D-50 (Tradename for a vinyl silane coupling agent predispersed on a hydrocarbon wax commercially available from Elastochem)	1.0
Sunpar 2280 (Tradename for a paraffinic process oil commercially available from the Sun Company)	9.8
Plasthall DOZ (Tradename for Di-2-Ethylhexyl Azelate commercially available from C.P. Hall Co.)	13.3
Plasthall DIDG (Tradename for Diisodecyl Glutarate commercially available from C.P. Hall Co.)	13.3

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Silvex 113-20-C (Tradename for a mineral oil treated aluminum flake of 22 micron average particle diameter commercially available from Silberline Manufacturing)	8.5
Drimix SR-297-75E (Tradename for 1,3 butylene dimethacrylate dispersion commercially available from Kenrich Petrochemicals)	7.0
E (VC) D-40 (Trade name for a difunctional peroxide dispersion commercially available from Elastochem)	4.5

The conformable stress control material 20 is described in U.S. patents 5,804,630 and 6,015,629. The conformable stress control material 20 is comprised of a resin component which consists of a blend of two polymeric resins; epihalohydrin polymers and insulating polymers having an electrical dissipation factor ($\tan \delta$) of less than 1.

Epihalohydrin polymers suitable for use are the elastomeric polymers of an epihalohydrin in homopolymer or copolymer form. Such polymers are prepared by polymerization of the monomeric material in mass or in solution with organometallic catalysts, and may be homopolymers, copolymers, terpolymers, etc. Examples of homopolymers include epichlorohydrin, or epibromohydrin; useful copolymers include copolymers of epihalohydrins with alkylene oxides, and copolymers with epoxides, e.g., propylene oxide, ethylene oxide, butene oxide, and epoxy ethers such as ethylglycidyl

ether, allylglycidyl ether and the like. Such polymers are available from Zeon Chemicals, Inc.

Preferred epihalohydrin polymers include copolymers with alkylene oxides, particularly ethylene and propylene oxides.

The resin component also contains an insulating polymer having a $\tan \delta$ of less than one. Useful polymers include silicone, EPM or EPDM and hydrocarbon rubbers. Useful silicones include silicones which are fluid at room temperature and gum silicones; gum silicones are preferred for easy compounding and processability; most preferred are those gum silicones having a durometer of about 30.

Commercially available silicone elastomers include those fluid silicones available as Dow Corning DC 10,000, and the like, and gum silicones available as Elastosil® R300/30 from Wacker Silicones Corporation, and Silastic® GP31 from Dow Corning, and the like.

This formulation produces a non-tacky, conformable stress control material comprising:

- a) about 100 parts of a resin component containing
 - 1) from about 20% to about 80% of an epihalohydrin polymer, and
 - 2) correspondingly, from about 80% to about 20% of an insulating polymer having a $\tan \delta$ of less than one,
- b) from about 8 to about 200 parts of a filler selected from the group consisting of barium titanate and hydrated aluminum silicate, and
- c) from 0 to 30 parts of a plasticizer.

Preferred non-tacky electrical stress control materials comprise:

- a) about 100 parts of a resin component containing

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- 1) from about 20% to about 80% of an
epihalohydrin polymer, and
- 2) correspondingly, from about 80% to about
20% of a silicone polymer having a $\tan \delta$
5 of less than one,
- b) from about 8 to about 200 parts barium
titanate, and
- c) from 0 to 30 parts of a plasticizer.

10 As stated earlier, the highest electrical stress
of a prepared cable 22 occurs at the cut back end of
the semi-conductive insulation shield 30. The present
invention coordinates two components held to specific
relative geometries based on their permitivities to
15 provide stress control.

The inner conformable stress control material 20
is positioned to extend in both directions from the cut
edge of the shield 30 and should have a thickness
sufficient to fill the radial step from the outer
20 surface of the cable insulation 28 to the outer surface
of the shield 30. The stress control tube 18 covers
the conformable stress control material 20 and extends
beyond the conformable stress control material 20 in
both directions from the edge of the shield 30.

25 The maximum internal electrical stress at the
cable insulation 28 is primarily affected by the
permitivity of the conformable stress control material
30. The relationship to predict the maximum stress is:

30 $S_{\text{internal maximum}} = (V / (R \ln (R/r))) A$

where:

$A = 1.69 - 1.63 \times 10^{-2} \epsilon_p,$

35

V is the applied voltage;

R is the outside radius of the cable insulation;

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r is the inside radius of the cable insulation; and

ϵ_p is the permittivity of the conformable stress control material.

The permittivity of the conformable stress control material must be high enough to prevent its breakdown at the maximum power frequency voltage withstand required for the cable and its attached termination to achieve the required voltage rating in accordance with industry standard tests. The breakdown strengths for the conformable stress control materials tested were about 11800 V/mm. The minimum values for the permittivity of the conformable stress control material at selected voltage levels are shown in the table below:

Voltage Class (kV)	Power Frequency Voltage Withstand (kV for 1 minute)	$V/(R \ln(R/r))_{MAX}$ for 2500 MCM (V/mm)	$\epsilon_{p(min)}$ for $V_{BD}=11800$ V/mm
5.0	25	10450	34
8.7	35	11320	40
15	50	8365	17
25	65	8735	21
28	70	8665	20
34.5	90	8820	22
46	120	8810	21
69	175	8245	16

As can be seen, the permittivity of the conformable stress control material should be at least about 16.

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Since the most common voltage range is 15 to 69 kV, the preferred value for the permittivity is greater than 22, and most preferably is greater than 25.

The maximum electrical stress along the outer surface of the termination sleeve 12 adjacent to either the end of the cable shield 30 or the end of the stress controlling compound 20 is affected by many parameters. The relationship to predict this maximum stress is:

$$10 \quad S_{\text{external maximum}} = (V / (R \ln (R/r))) B$$

where:

$$15 \quad B = 0.585 + 1.76 \times 10^{-3} \epsilon_p - 2.43 \times 10^{-3} \epsilon_t \\ + 7.32 \times 10^{-5} l_p - 4.45 \times 10^{-2} t_t \\ - 3.39 \times 10^{-2} t_p - 4.45 \times 10^{-5} \epsilon_p l_p$$

where:

20 ϵ_p is the conformable stress control material's permittivity;

ϵ_t is the stress control tube's permittivity;

25 l_p is the length of the conformable stress control material over the cable insulation in millimeters;

t_t is the thickness of the stress control tube in millimeters; and

30 t_p is the thickness of the conformable stress control material in millimeters.

This relationship assumes a thickness of the termination sleeve 12 of about 2 mm. This thickness being the thinnest which will withstand voltage breakdown through the sleeve 12 to conserve material.

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Increased thickness of the sleeve 12 will also reduce stress at the outer surface of the sleeve 12.

The maximum permissible external stresses, S , must be below a level which would cause electrical breakdown of air during impulse conditions. The impulse breakdown strength for terminations was found to be between about 3000 and 9200 Volts/mm. The preferred embodiment should maintain stress at required impulse levels at about 3150 Volts/mm. This factor allows a maximum quantity for B to be calculated. The maximum permissible values for B at Voltages of interest are listed in the table below:

Voltage Class (kV)	Lightning Impulse BIL (kV)	$V/(R \ln (R/r))_{MAX}$ for 2500 MCM (V/mm)	$B_{(MAX)}$ for $V_{BD}=9200$ V/mm
5.0	75	800	.292
8.7	95	780	.300
15	110	465	.499
25	150	510	.456
28	175	550	.423
34.5	200	500	.470
46	250	465	.502
69	350	420	.558

15

From the relationship for B given above it can be seen that increases in the permittivity of the conformable stress control material 20 and the length of the conformable stress control material 20 tend to increase the stress at the outer surface of the sleeve 12, although this is offset somewhat by the last term of the relationship for B , wherein it can be seen that the product of the permittivity and length of the conformable stress control material 20 tends to decrease this stress. Increases in the permittivity and

25

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thickness of the stress control tube 18 both tend to decrease the stress at the outer surface of the sleeve 12, and strongly so. As stated above, increased thickness of the termination sleeve 12 will also reduce the stress at the outer surface of the sleeve 12. However, this thickness is maintained at the minimum required to prevent breakdown of the sleeve 12 itself, approximately 2 mm, since the silicone from which the sleeve 12 is made is relatively expensive.

In practice, it is preferred that the thickness of the conformable stress control material 20 be at least 1 mm and most preferably between 2 and 3 mm to ensure that the material 20 completely fills the step at the cut end of the shield 30. The length of the conformable material 20 is at least 10 mm and preferably 25 to 50 mm along the cable insulation 28, in addition it is preferred that the conformable material extend about 10 mm on top of the cable shield 30 to ensure intimate contact with the shield 30, although this extension is not necessary so long as there is contact between the conformable stress control material 20 and the cable shield 30.

In a first embodiment of the invention, wherein stress controlling compound is positioned only adjacent the cut end of the cable shield 30, the stress control tube 18 is preferably about 60 mm long, it being found that a longer length has no further effect for tube 18 permitivities of less than 50. To avoid limiting the range of cable sizes with which the stress control termination can be used, the stress control tube 18 should not extend beyond the cut end of the cable insulation 28 and should not extend beyond the cut-back point of any further layers (for example, any metal shielding) above the cable shield 30. The thickness of the tube 18 is preferably at least 1 mm and most preferably between 2 and 3 mm.

Manipulation of these various parameters permits one to predict, for example, the necessary permitivity

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of the stress control tube 18 to be determined based on dimensions given or allows one to predict the dimensions the two stress control components must assume for given permitivities of the materials.

5 The use of the two component stress control system described above consisting of the conformable stress control material 20 and the stress control tube 18 greatly improves stress control over approaches in the past, and so permits either improved electrical
10 performance for a give termination length or allows a reduction in termination length (about 40% of prior devices) at a given performance level. Of course, these advantages may be combined to produce a somewhat shorter termination with improved electrical
15 performance. Since all components may be loaded on the core 14 of the termination assembly 10, application of the components is a one-step process and so is very economical and convenient.

 The use of the two component stress control system
20 described above (having conformable stress control material in contact with the end of the cable shield and extending along the cable insulation, and then covered by a polymeric stress control tube) so greatly improves stress control over prior art approaches that
25 the stress adjacent the lug becomes the area of highest stress. For example, in a termination without stress control the stress adjacent the cut cable shield can be approximately 100 times as great as the stress at the
30 lug end of the termination, perhaps 1000 kV/cm at the cut shield and 10 kV/cm at the lug end. The two component stress control system is effective in reducing the stress adjacent the cut shield to the point where the surface stress at the lug end is the predominate stress on the surface of the termination.

35 Until the introduction of the two component stress control system, there was no interest in addressing stress control at the lug end of the termination, because the stress adjacent the lug was small compared

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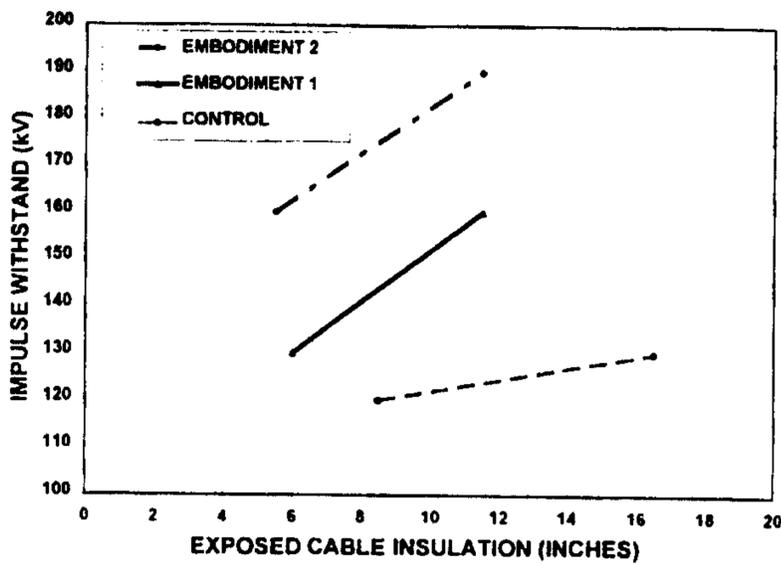
to the stress adjacent the cut shield. However, the large reduction in stress adjacent the cut shield allows stress control adjacent the lug to be addressed. Stress control adjacent the lug becomes important because the shorter termination lengths which are possible with the two component stress control system cause electrical stresses in the vicinity of the lug to rise to a level which may be significant. (It should be noted that the level of stress near the lug is still low when compared to the level of stress which existed in the termination prior to the introduction of the two component stress control system disclosed above).

Prior art terminations, including the inventive termination shown in Figures 1-3, utilize a silicone sealing compound 40 adjacent the lug end of the termination to remove air voids around the lug and to provide a weather tight seal. It has been discovered that by replacing the silicone sealing compound 40 with the stress control compound disclosed herein, electrical stress adjacent the lug is significantly reduced. In particular, this second embodiment of the inventive termination having a first region of stress control material 20 (in contact with the cut end of shield 30) and a second region of stress control material 21 (in contact with the cut end of the cable insulation 28 and lug) exhibits improved AC withstand performance and impulse withstand performance.

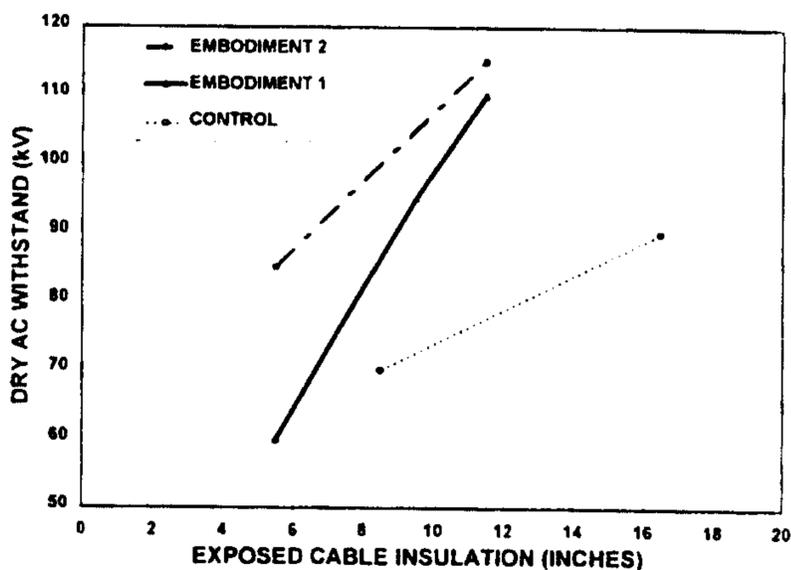
The levels of improved performance exhibited by the first and second embodiments of the inventive terminations are illustrated in Graphs 1 and 2.

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Graph 1



Graph 2

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3
4 Graphs 1 and 2 compare performance of a tubular
5 termination without stress control compound (Control),
6 with conformable stress control compound adjacent the
7 cut end of the cable shield 30 only (Embodiment 1), and
8 with conformable stress control compound adjacent to
9 both the cut end of the shield 30 and the cut end of
10 the insulation 28 and lug (Embodiment 2). A stress
11 control tube is used in all examples. Although the
12 graphs illustrate performance of tubular terminations,
13 similar relative performance improvements would be
14 expected with skirted terminations.

15 As can be seen from Graphs 1 and 2, the
16 introduction of first region of stress control compound
17 adjacent the cut end of shield 30 produces superior
18 performance to a termination without stress control
19 compound, and use of second region of stress control
20 compound adjacent the cut end of insulation 28 and

1 lug results in a termination which exhibits even better
2 performance for a given termination length.
3 Accordingly, terminations may be made shorter for a
4 given performance level.

5 It will be recognized that multiple variations of
6 the second embodiment of the inventive termination are
7 possible, depending upon the particular application of
8 the termination. In particular, the polymeric stress
9 control tube 18 may be omitted from the termination
10 entirely (not shown), or may extend between the first
11 and second regions of stress controlling material 20,
12 21, or may be disposed over only one or both of the
13 regions of conformable stress control material 20, 21.
14 Figure 4 shows the stress control tube 18 extending
15 between the first and second regions of stress control
16 material 20, 21, while Figure 5 shows the stress
17 control tube 18 extending only over the first region of
18 stress control material 20. The first and second
19 regions of stress controlling material 20, 21 may also
20 be extended through the termination such that the first
21 and second regions 20, 21 contact each other (not
22 shown).

23 As described above, the conformable stress control
24 material is preferably comprised of a blend of
25 epihalohydrin polymers and insulating polymers having
26 an electrical dissipation factor of less than 1, and
27 has a permittivity ϵ_p of at least about 16 and
28 preferably between about 20 and 50.

29 The use of the stress control system described
30 above consisting of the two regions of conformable
31 stress control material greatly improves stress control
32 over approaches in the past, and so permits either
33 improved electrical performance for a give termination
34 length or allows a reduction in termination length at a
35 given performance level. Since all components may be
36 loaded on the core 14 of the termination assembly 10,
37 application of the components is a one-step process and
38 so is very economical and convenient.

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CLAIMS:

1. **The termination for an electrical power cable including an inner conductor, electrical insulation surrounding the conductor and a semi-conductive shield surrounding the insulation, wherein the shield is removed to a predetermined length and the insulation is removed to a lesser predetermined length to expose the conductor, the termination comprising:
a first region of conformable stress control material having permittivity greater than 10 in contact with a cut end of the cable shield and extending along the cable insulation;
a second region of conformable stress control material having permittivity greater than 10 disposed in contact with a cut end of the cable insulation;
a polymeric stress control tube extending between said first and second regions of conformable stress control material; and
a polymeric electrically insulating layer extending from a first end of the termination to a second end of the termination, the electrically insulating layer disposed over said first and second regions of conformable stress control material and over said polymeric stress control tube.**
2. **The termination of claim 1, wherein the polymeric stress control tube is disposed over said first region of conformable stress control material.**
3. **The termination of claim 1, wherein the polymeric stress tube is disposed over said second region of conformable stress control material.**
4. **The termination of claim 1, wherein the first and second regions of conformable stress control material contact each other.**
5. **The termination of claim 1, wherein the permittivity ϵ_p of said conformable stress control material is at least about 16.**

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6. The termination of claim 1, wherein the permittivity ϵ_p of said conformable stress control material is between about 20 and 50.

7. The termination of claim 1, wherein the length of said first region of conformable stress control material, the thickness of said first region of stress control material and the thickness of said stress control tube are defined by the following equation, wherein B is the parameter used to calculate the maximum external electrical stress on the outer surface of the insulting layer adjacent the cut end of the cable shield, and wherein

$$B = 0.585 + 1.76 \times 10^{-3} \epsilon_p - 2.43 \times 10^{-3} \epsilon_i \\ + 7.32 \times 10^{-5} l_p - 4.45 \times 10^{-2} t_t \\ - 3.39 \times 10^{-2} t_p - 4.45 \times 10^{-5} \epsilon_p l_p$$

wherein:

ϵ_p is said conformable stress control material's permittivity;

ϵ_i is said stress control tube's permittivity;

l_p is the length of said conformable stress control material over said cable insulation in millimeters;

t_t is the thickness of said stress control tube in millimeters; and

t_p is the thickness of said conformable stress control material in millimeters.

8. The termination of claim 8, wherein B is less than about 0.56.

9. The termination of claim 1, wherein the conformable stress control material is comprised of a blend of epihalohydrin polymers and insulating polymers having an electrical dissipation factor of less than 1.

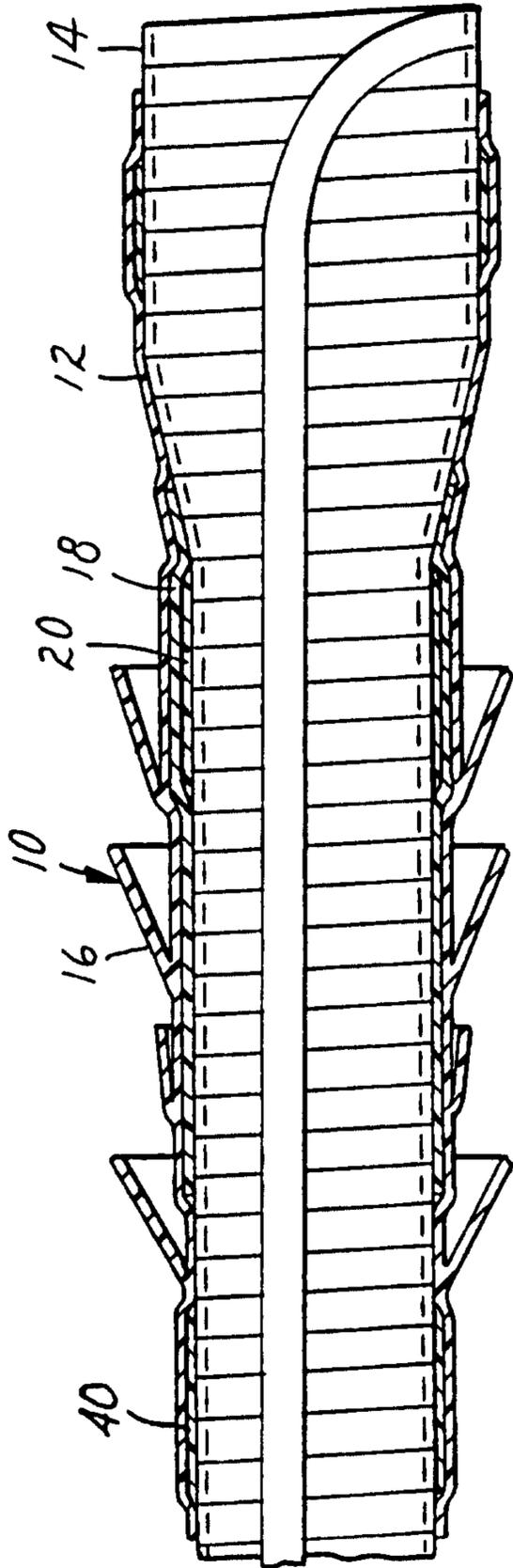


FIG. 1

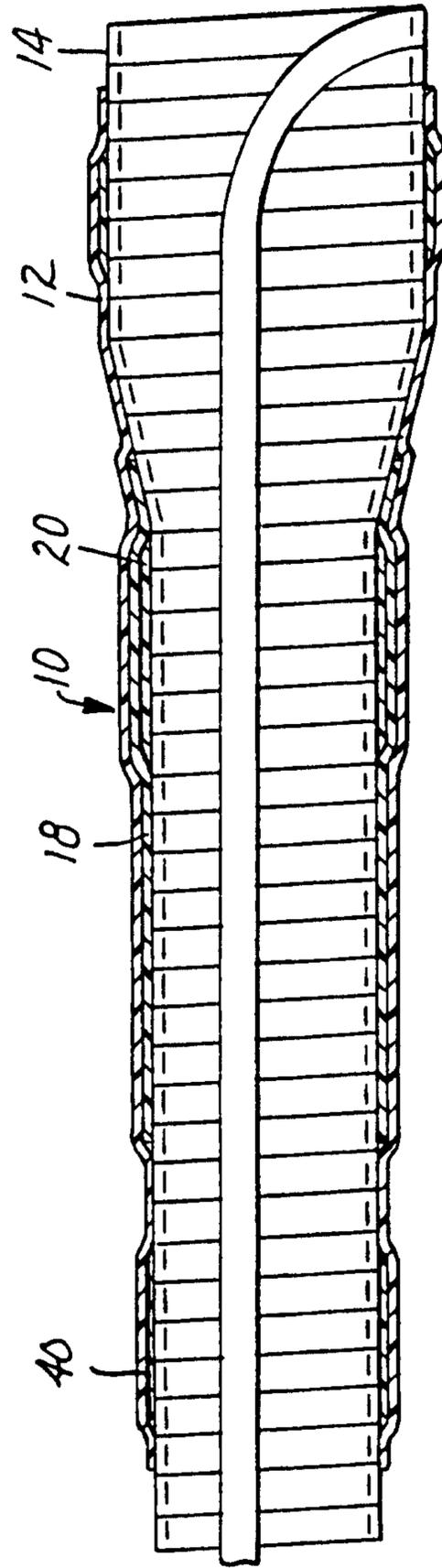


FIG. 2

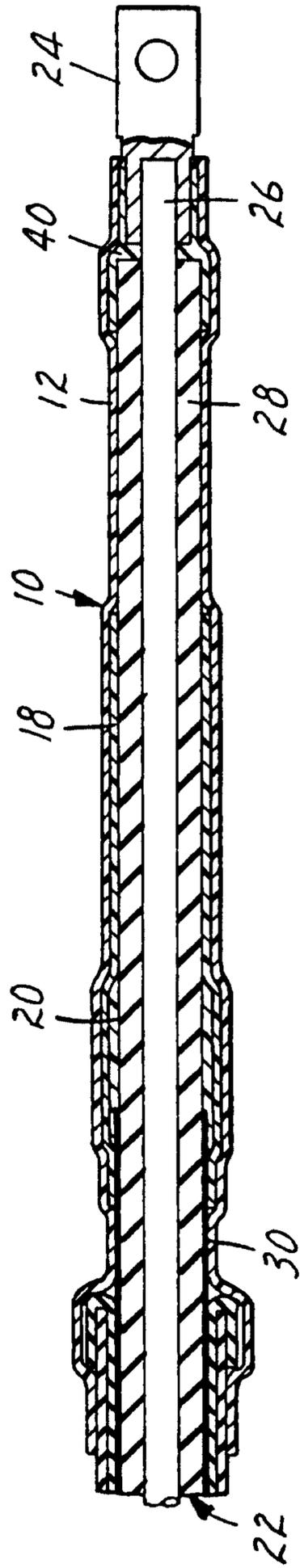


FIG. 3

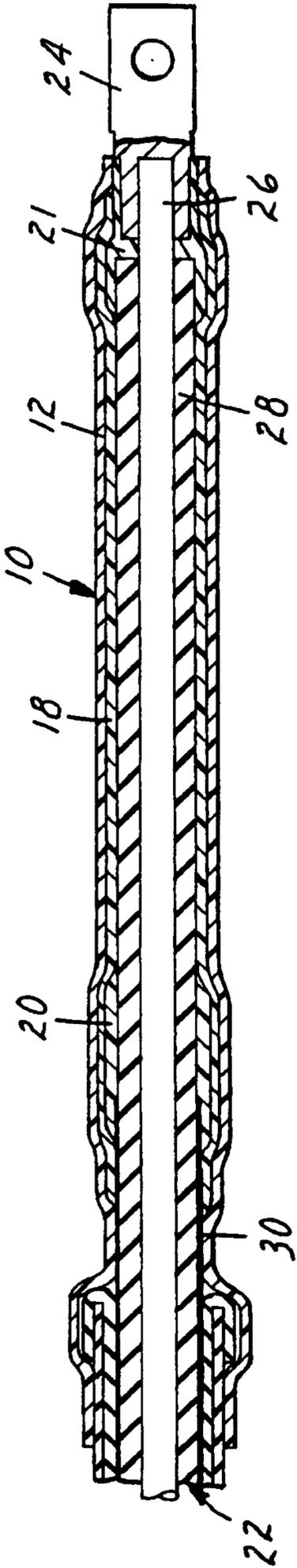


FIG. 4

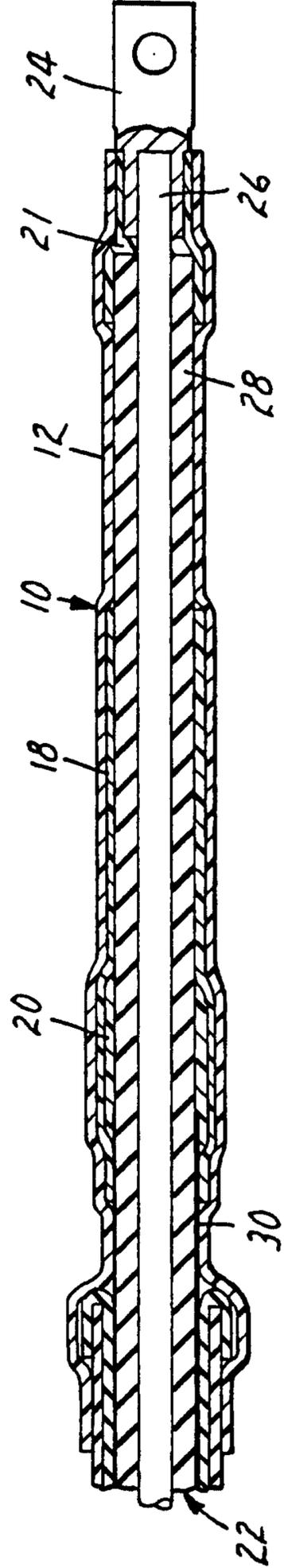


FIG. 5

