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Bunish et al.

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[54] **GROUNDED POWER CABLE**

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[52] **U.S. Cl.** ..... **174/115**, 174/117 F, 174/120 SR

[51] **Int. Cl.** **H01b 9/00**

[58] **Field of Search** ..... 174/115, 113 R, 120 R, 174/120 SR, 117 F

[56] **References Cited**

UNITED STATES PATENTS

1,977,787	10/1934	Wodtke	174/115
2,729,696	1/1956	Mapelsden	174/117 F
3,013,109	12/1961	Gorman	174/113 R
3,600,500	8/1971	Schoerner	174/115

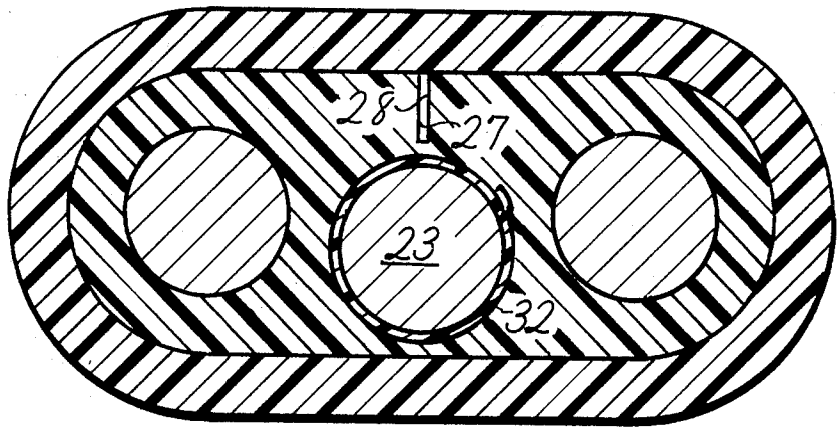
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[57] **ABSTRACT**

An economical parallel conductor grounded cable that can, if desire, be insulated in a single operation, has the grounding wire between the phase conductors but close to one flat surface of an extrusion of insulation. This extrusion is slotted from the other flat surface to a point close to the ground and is covered by a second, non-adhering, extrusion of uniform wall thickness.

8 Claims, 2 Drawing Figures



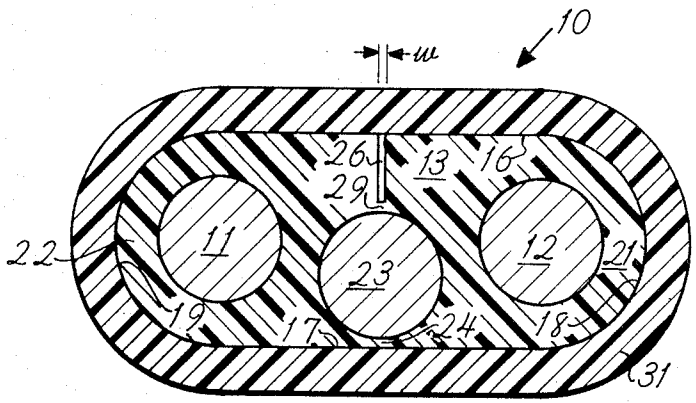


Fig. 1

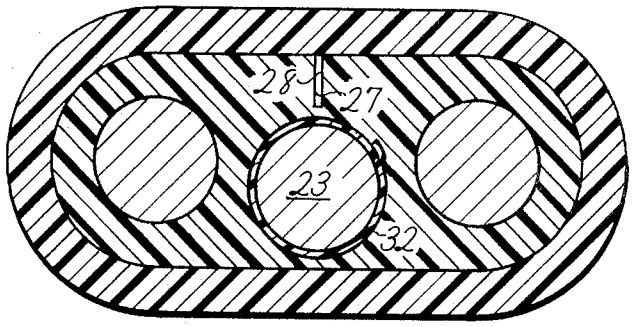


Fig. 2

GROUNDED POWER CABLE

BACKGROUND OF THE INVENTION

Six-hundred volt cables include types that are recognized in the art and particularly by Underwriters' Laboratories as types NM, NMC, and UF which can be installed under many building codes without conduit for conveying power within buildings. Such cables, since they are not proctected by conduits must themselves have sufficient toughness and fire resistance not to constitute a hazard. At the same time they should be easy to install and connect and inexpensive enough to sell in a very competitive market. Cables of the type on which the present invention is an improvement have two parallel phase conductors, each with its own sheath of extruded insulation and a grounding conductor laid between them, parallel to the phase conductors. A tough extruded jacket envelopes the grounding and insulated phase conductors. U.S. Pat. No. 3,600,500 describes a cable of this type. Other types of parallel-conductor cables are exemplified by U.S. Pat. No. 1,977,787 which has two power conductors with separate D-shaped insulations laid parallel within an overall braid covering and having the inside flat surfaces of the D's grooved to hold a stranded copper neutral; U.S. Pat. No. 2,081,634 wherein the insulation on the center conductor is grooved to support two additional insulated conductors with a rubber belt overall, and U.S. Pat. No. 2,729,696 for an unjacketed "rip cord" in which the insulation is slotted at both sides of the center conductor.

SUMMARY

We have invented a cable of improved simplicity and economy of manufacture comprising first and second power conductors and a first polymeric extrusion of electrical insulating composition directly encasing these power conductors. The extrusion comprises two opposite flat surfaces and two opposite curvilinear surfaces with the power conductors symmetrically spaced from both the flat and curvilinear surfaces. A grounding conductor which is solid in the sense of consisting of a single wire rather than being stranded from a plurality of wires, and may be surrounded by a longitudinal tape separator, is enclosed in the first extrusion parallel to the power conductors and is centered between the curvilinear surfaces close to one of the flat surfaces. A narrow slot, defined by walls in the first extrusion, extends from the other flat surface to a point close to the grounding conductor. A second extrusion of substantially uniform wall thickness directly surrounds, but does not adhere to, the first extrusion. In a preferred embodiment the thickness, between flat surfaces, of our first extrusion is at least 150 mils and its thickness between the grounding conductor and both the slot and the closest flat surface is between five and 20 mils.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows a section of a cable made to our invention.

FIG. 2 shows a section of another embodiment of a cable of our invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring to FIG. 1 a cable indicated generally by the numeral **10** has parallel phase conductors **11, 12** symmetrically encased in an extrusion **13** of an insulating composition such as polyvinyl chloride or, for example, flame retardant polyethylene. The extrusion **13** is applied directly to the surface of the metal of the conductors **11, 12** which may be aluminum or copper and may be tinned. The conductors **11, 12** may be solid, or stranded of a plurality of wires in a known manner. The extrusion **13** has opposite parallel flat surfaces **16, 17** and opposite semicircular surfaces **18, 19.** Being symmetrically encased in the extrusion **13** the conductors **11, 12** are centered between the surfaces **16, 17** and a wall thickness **21** separating the conductor **12** from the surface **18** substantially equals a wall thickness **22** of the conductor **11** from the surface **19.** Since the conductors **11, 12** will carry current at operating voltages the wall thickness of the extrusion **13** at any point around them must be sufficient to withstand the voltage stress under operating conditions. For 600 volt service the thickness **21, 22** should thus be 30 mils, according to industry standards. A solid, i.e. unstranded, grounded conductor **23** is also encased in the extrusion **13,** centered between the conductors **11, 12** but offset to be close to the wall **17.** A wall thickness **24** of the extrusion **13** between the conductor **23** and the surface **17** should be as low as can be consistantly extruded commercially without gaps which is about 5 mils and no greater than 20 mils to tear easily for exposure of the conductor **23** at termination. A slot **26,** defined by walls **27, 28** in the extrusion **13** extends from the surface **16,** to a point close to the conductor **23** leaving a thickness **29** of extrusion between the slot **26** and the conductor **23** comparable to the thickness **24.** Considerations governing the thickness **24,** hereinabove stated, also govern the thickness **29.** A second extrusion **31** of tough polymeric composition directly surrounds the extrusion **13.** The extrusion **31** has a uniform thickness sufficient to provide mechanical protection to the extrusion **13.** The extrusion **31,** which should be abrasion resistant, may, in fact, comprise the same basic polymer, such as polyvinyl chloride, as the extrusion **31** or it may be compounded for greater tensile strength, moisture resistance and toughness in a known manner at some sacrifice of electrical properties. Although the extrusion **31** is applied directly over the extrusion **13** it is essential that it does not adhere to the latter. Non-adherence can be accomplished by sufficient chilling of the surfaces **16, 17, 18, 19** before the second extrusion is applied, and by application of liquid or powdered anti-adhesive agents of known types.

The thicknesses of insulating wall separating the grounding conductor **23** from the phase conductors **11,12** exceeds the thicknesses **21, 22** but if additional insulation is desired between the grounding and phase conductors a longitudinal separator tape **32** may be applied over the conductor **23** during the operation of extruding the extrusion **13.** This tape **32** is shown in FIG. **2** with a slight overlap but it may be butt lapped or applied with a slight gap if the gap does not face one of the phase conductors. A polyester film tape, one to three mils thick, is preferred for the separator **32,** but tapes of other film forming polymers or paper tapes can also be applied.

Our cable can be manufactured in two different operations, first extruding the extrusion **13,** and, separately extruding the second extrusion **31.** However, it is preferable to apply the extrusions in tandem in a single

operation both for considerations of economical manufacture and for the protection of the first extrusion from separation at the thin points **24, 29.**

A cable made with No. 12 Awg phase conductors as per FIG. **1** will exemplify suitable dimensions of cables made to our invention.

EXAMPLE

No. 12 Awg conductors 11, 12, solid aluminum, diameter	81
grounding conductor 23, solid aluminum, diameter	81
distance between centers of conductors 11, 12	220
greatest distance between surfaces 18, 19	361
distance between surfaces 16, 17	170
wall thickness of extrusion 31	30
thickness 24	15
thickness 29	8
width of slot 26, *w*	15

The distance between the flat surfaces **16, 17** of the cable of the Example with No. 12 Awg conductors was 170 mils. This distance should be varied, of course, with conductor size, but, in no case be less than 150 mils.

In making a splice or termination in our cable **10** a suitable length of the second extrusion **31** is cut away. Because of its freedom from adhesion this length can readily be removed from the underlying portion of the extrusion **13.** The half of the extrusion **13** encasing the conductor **11** is manually pulled apart from the half encasing the conductor **12,** tearing the thicknesses **24** and **29** to expose the conductor **23.**

The foregoing description has been exemplary rather than definitive of our invention for which we desire an award of Letters Patent as defined in the appended claims.

We claim:

1. A cable comprising:

A. first and second parallel power conductors,

B. a first polymeric extrusion of electrical insulating composition directly encasing said power conductors, said first extrusion comprising two opposite flat surfaces and two opposite curvilinear surfaces, said power conductors being symmetrically spaced from said flat and said curvilinear surfaces,

C. a solid grounding conductor, parallel to said power conductors, said grounding conductor being enclosed in said first extrusion, and said grounding conductor being centered between said curvilinear surfaces and close to one of said flat surfaces,

D. walls defining a narrow slot in said first extrusion extending from the other of said flat surfaces to a point close to said grounding conductor,

E. a second extrusion of abrasion resistant polymeric composition directly surrounding said first extrusion, said second extrusion being of substantially uniform wall thickness and said second extrusion being free from adhesion to said first extrusion.

2. The cable of claim **1** wherein the thickness of said first extrusion between said flat surfaces is at least 150 mils and the thickness of said first extrusion at a point of one of said flat surfaces close to said grounding conductor is between five and 20 mils.

3. The cable of claim **1** wherein the thickness of said first extrusion between said flat surfaces is at least 150 mils and the thickness of said first extrusion between said slot and said grounding conductor is between five and 20 mils.

4. The cable of claim **2** wherein the thickness of said first extrusion between said flat surfaces is at least 150 mils and the thickness of said first extrusion between said slot and said grounding conductor is between five and 20 mils.

5. The cable of claim **1** comprising a longitudinal tape separator directly surrounding said grounding conductor.

6. The cable of claim **2** comprising a longitudinal tape separator directly surrounding said grounding conductor.

7. The cable of claim **3** comprising a longitudinal tape separator directly surrounding said grounding conductor.

8. The cable of claim **4** comprising a longitudinal tape separator directly surrounding said grounding conductor.

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