Jan. 13, 1959 L. EMANUELI 2,867,897

CUTTING PROCESS OF OIL-FILLED ELECTRIC CABLES

Filed Feb. 1, 1954 2 Sheets-Sheet 1

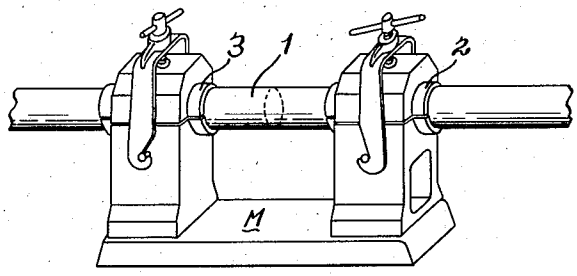
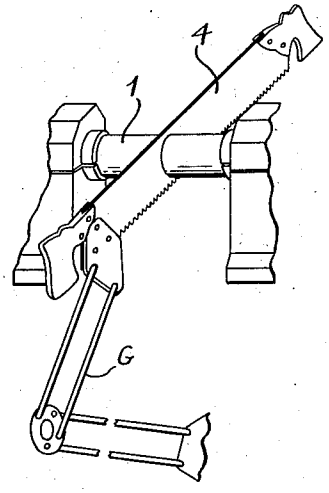



Fig. 1

Fig. 2




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Fig. 3

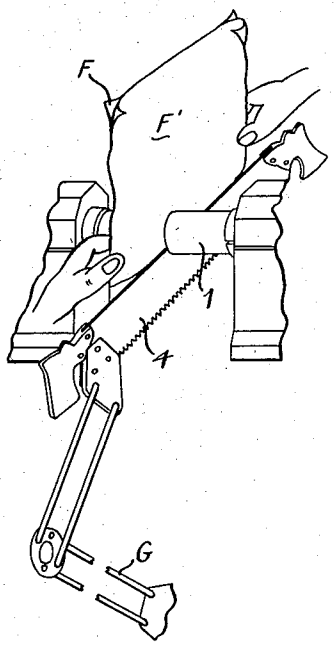



Fig. 4

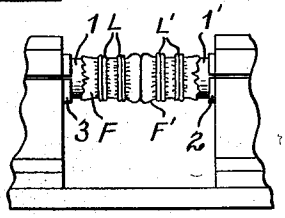



Fig. 5

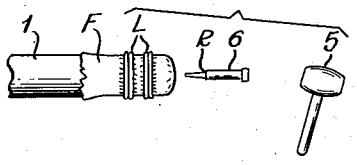
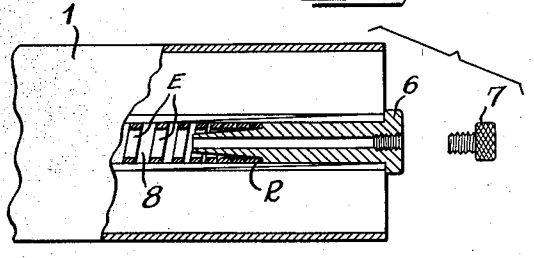



Fig. 6




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United States Patent Office

2,867,897

Patented Jan. 13, 1959



2,867,897

# CUTTING PROCESS OF OIL-FILLED ELECTRIC CABLES

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Application February 1, 1954, Serial No. 407,193

Claims priority, application Italy February 5, 1953

7 Claims. (Cl. 29—401)

The operation of cutting an oil-filled electric cable containing oil under pressure, for the purpose of carrying out a jointing or a termination and also of cutting into two sections a cable length, has always required the best care.

During the cutting operation, if particular attention is not paid, air can easily penetrate inside the duct (or ducts) feeding oil to the cable and sooner or later enter the insulation, thus causing, as it is known, a considerable decrease of the dielectric strength of the cable itself.

The most efficient precaution used heretofore has been to keep the cutting point as high as possible with respect to the cable. Nevertheless this is not always possible as, for instance, in jointings made in low-vault tunnels on sloped cables; furtherly, the more frequent employment of cables having larger and larger oil ducts and filled with oil having lower and lower viscosity has remarkably increased the danger of air introduction caused from the cutting operation.

The aim of the present invention is to provide a general method which can eliminate, or at least minimize, the danger of air introduction into the cable duct and above all to render the cutting operation as little as possible dependent on the jointer's skill.

The process is now described in detail with reference to the annexed drawings where Fig. 1 shows the cable 1 held by a special vise M having two jaws 2—3 so as to keep the two cable sections closely contacting the blade during cutting.

The cut is preferably carried out with a thin saw 4 (Fig. 2) having its blade a little wider than the cable diameter so that, while it penetrates into the cable 1, the cut is closed by the blade itself and the oil tends to leak under pressure alongside the whole cutting periphery, the entrance of air being thus avoided.

The saw may be suitably provided with a guiding device G which maintains the blade always parallel to a certain direction in order to keep the cut well closed, said device being, for example, a pantograph as that schematically indicated in Figs. 2 and 3.

When the cutting operation is ended, two sheets F—F′ of very thick and little permeable filter cloth are introduced into the cutting space, without moving the two cable sections, while the saw is pushed downwards and eventually removed from the bottom.

A thin saw may be also employed having a narrower blade, carrying out the introduction of the two sheets gradually while the blade, moving downward, leaves the cut free, but it is generally not easy to accomplish both operations at the same time.

When the two sheets have been completely introduced and the saw is free, each sheet is wrapped onto one of the two parts 1—1′ (Fig. 4) of the cable and is bound around it, as a hood, by means of strong bindings L—L′.

Now the two parts 1—1′ of the cable may be released from the jaws 2—3 without danger that air may enter the duct (or ducts); the cloth will swell, while oil under pressure leaks from its pores in a very small flow.



A steel pin 6 (Fig. 5) having an axial bore and a conical end, and acting as a restricter of the oil duct, is successively hammered with hammer 5 and, after having perforated the cloth, is forced into the duct 8 (Fig. 6) of each part of the cable (if the ducts are more than one, several pins 6 shall be employed).

This pin 6 has a diameter equal to the maximum diameter of the oil duct, thus obtaining the advantage of making the pin itself adhere to the walls of the duct 8.

When the operation is finished the cloth may be removed, while a temporary cap 7 is screwed into the head of pin 6.

In these conditions each cable section may be freely moved according to the subsequent operations needed for the jointing or termination, thus avoiding the danger of air introduction into the duct (or ducts) 8.

By the above process the cutting of an oil-filled cable under pressure may be made in a safe way, whatever the slope of the cable itself may be.

Furtherly, when the cutting operation is accomplished, and the pin 6 is forced into the oil duct 8, the possibility also exists that the end of the metal helix E (Fig. 6) sometimes present, which limits duct 8, may be pushed inwardly of the cable. For this purpose the pin 6 may be provided with a suitable step R (see Figs. 5 and 6). Fig. 6 refers to a single-core cable.

The filter cloths F—F′ are thick enough to minimize the outward flow of oil and are slightly permeable so that any air entrapped between the respective cloths and their cable ends, as well as any air that permeates the cloths themselves at the time they are introduced between the cut cable ends, will be expelled by the slow outward flow of oil. Although it has been found that the filter cloths F—F′ do not have to be impregnated with cable oil at the time they are introduced between the cut cable ends, it is within the purview of the present invention to use filter cloths F—F′ that are initially impregnated with the same oil as is in the cable.

When each cable end is in condition for the subsequent operations needed for jointing or terminating the cable, as above described, oil under pressure within the cable continues to seep outwardly through the insulation between the cable conductor and the cable sheath. This outward seepage of oil is necessarily very slow because it must permeate through the body of insulation between the cable conductor and the cable sheath. In the interest of clearness, the cable insulation between the cable conductor and the cable sheath has been left blank in Fig. 6 of the drawing.

While I have herein illustrated the invention as applied to a single conductor high voltage cable, it is, of course, clearly applicable to a multi-conductor cable as hereinabove set forth. Also, while I have illustrated the present invention as used in connection with a cable wherein the oil duct extends axially through the stranded electric conductor, it is clear that the present invention is equally applicable to the cutting of oil filled electric cable containing oil under pressure wherein the oil duct within the cable is separate from the electric conductor or conductors, rather than as illustrated in Fig. 6.

What is considered new and desired to be secured by Letters Patent is:

1. A process for cutting and sealing oil-filled electric cables under pressure having the purpose to avoid air introduction into the oil ducts, which comprises cutting a cable lying on whatever slope by means of a saw of a width at least sufficient to overlay and cover the oil ducts as the blade completes its cable cutting operation and maintaining the two cable sections closely contacting the saw blade during the sawing operation and subsequently, without removing said parts, introducing into the cut, to close it, during the extraction of said blade, two sheets

of thick slightly permeable cloth which successively seals each of the two parts into which the cable has been cut.

2. A process for cutting and sealing oil-filled electric cables under pressure according to claim 1, characterized in that the cutting operation is carried out by means of a thin saw having its blade a little wider than the diameter of the cable.

3. A process for cutting and sealing oil-filled electric cables under pressure according to claim 1, characterized in that, in order to maintain the cut well closed independently of the jointer's skill during operation, the saw is guided to force the blade to remain always parallel to a certain direction.

4. A process for cutting and sealing oil-filled electric cables under pressure according to claim 1, characterized in that tapered pins are forced in the oil feeding ducts through the sheets of material closing the cut cable ends, whereafter, upon the completion of this operation, said sheets of material can be removed.

5. A process for cutting and sealing oil-filled electric cables under pressure according to claim 4, wherein the cables are of the type provided with an oil duct having a metal helix therein, characterized in that the tapered pins, having a diameter equal to the maximum diameter of the oil ducts, are provided with a step to push inwardly of the cable the metal helix present, which limits the oil duct.

6. A process for cutting and sealing an oil-filled electric cable under pressure having the purpose of avoiding air introduction into the oil duct or ducts of a cable laying on whatever slope which comprises the following operations: cutting the cable by means of a thin saw having its blade a little wider than the diameter of the cable, maintaining the saw always parallel to a stated direction during the cutting in order to prevent air from entering the kerf below the blade and at the same time maintaining the two cable sections, that are obtained in cutting the cable, in close contact with the saw blade; introducing into the kerf formed by the blade, to close it, during the extraction of the blade and without removing said sections, two sheets of a thick, slightly permeable cloth which, after the blade has left the cut, are each bent over a cable end to form a hood and are bound around said cable end; separating the ends of the two cable sections from one another; closing the ducts by forcing bored tapered pins into the respective ducts by piercing the hood, then inserting temporary bore closing caps into the heads of the respective pins; and removing the cloth hoods when the operation is over.



7. A process according to claim 1, wherein the cable is of the type provided with an oil duct having a metal helix therein, characterized in that the bored tapered pins are provided with a suitable step having the purpose to push into the interior of the cable the metal helix, where such is present, which limits the oil duct or ducts.

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# CERTIFICATE OF CORRECTION

Patent No. 2,867,897 January 13, 1959

Luigi Emanueli

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 18, for the claim reference numeral "1" read -- 6 --.

Signed and sealed this 5th day of May 1959.

(SEAL)
**Attest:**

KARL H. AXLINE
**Attesting Officer**

**ROBERT C. WATSON**
**Commissioner of Patents**