

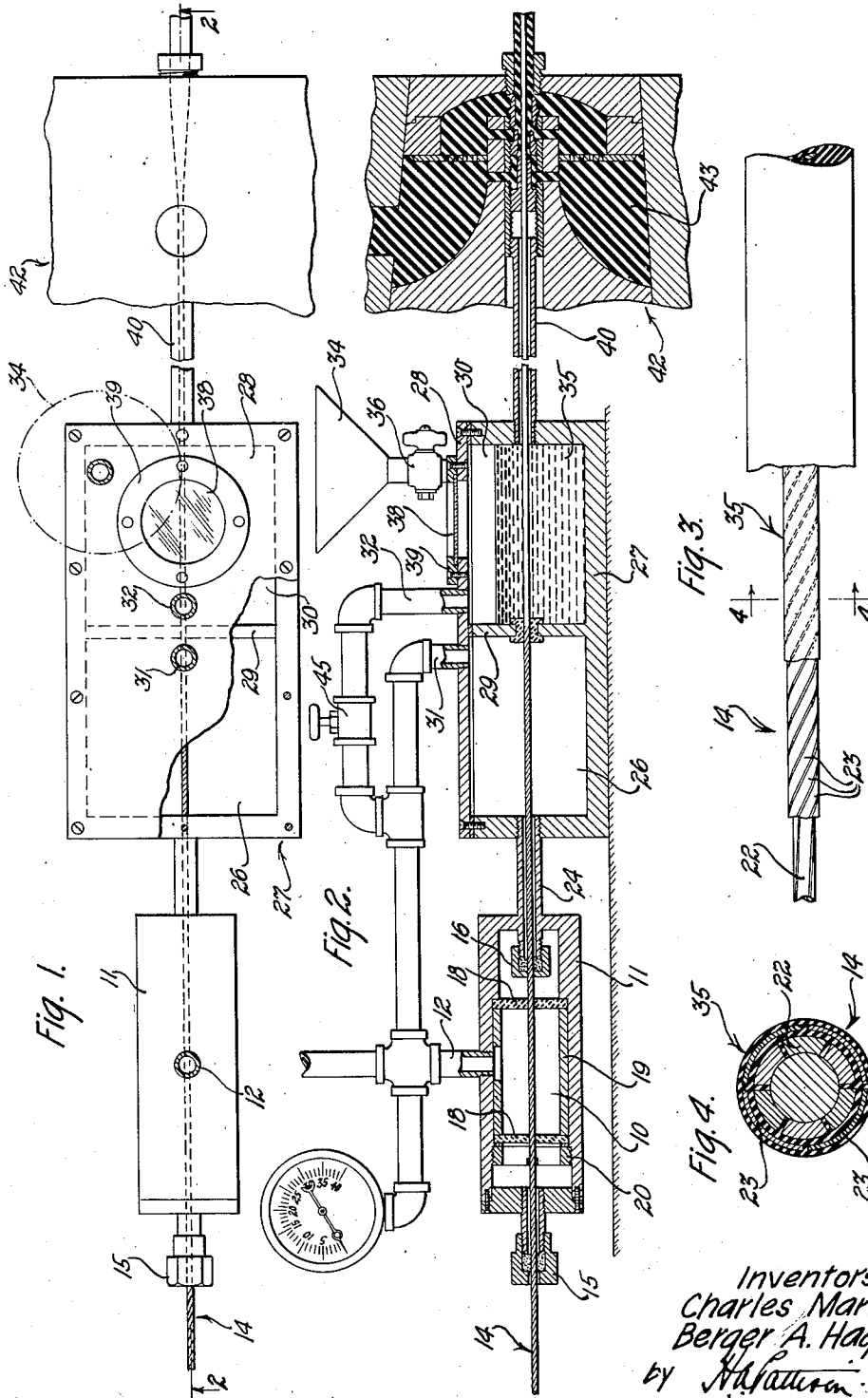
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C. MARTELL ET AL

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METHOD OF AND APPARATUS FOR COATING CORES

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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR COATING CORES

Application filed August 20, 1927. Serial No. 214,224.

This invention relates to methods of and apparatus for coating cores, and more particularly to methods of and apparatus for applying material to a continuously loaded submarine cable conductor.

It has been found that the extremely high water pressures to which continuously loaded submarine cables are subjected upon submergence tend to deform the loading material which deformation would cause the permeability of the loading material to be reduced due to mechanical strains therein. These strains may be introduced as a result of non-uniform pressure experienced by the loading tape and to equalize the distribution of such pressure it has been proposed to apply a semi-fluid material between the conductor core and the loading material as well as between the loading material and the conductor insulation. A semi-fluid material suitable for this purpose may be a liquid bitumen of the type specifically referred to in the application of A. R. Kemp, filed January 7, 1923, Serial No. 617,511, and issued February 5, 1929, as Patent No. 1,700,766, which will remain fluid at temperatures and pressures to which the cable is subjected while in service. In order to overcome the tendency of the loading material to become deformed, the semi-fluid material should completely fill all of the interstices between the adjacent turns of the loading material or tape and also the spaces between the tape and the conductor and thereby provide a pressure equalizing medium for the loading tape wound on the conductor.

The primary object of this invention is to provide a simple and improved method of and efficiently operable apparatus for continuously applying material to a core.

In accordance with the general features of the invention an apparatus representative of one means by which the improved method may be effectively practiced is provided, which consists of a vacuum chamber through which a loaded conductor may be passed for the purpose of evacuating the interstices between the loading material and the conductor. From this chamber the conductor is passed directly into a second chamber where-

in it is further subjected to evacuation and from this chamber the conductor, the interstices of which are thoroughly evacuated, is drawn through a semi-fluid impregnating or filling material which is free from pressures in excess of atmospheric pressure. The fluid chamber may be evacuated to completely remove air bubbles from the contained fluid as the conductor passes therethrough and to prevent the semi-fluid material from flowing into the evacuating chamber associated therewith.

These and other objects will be apparent from the following detailed description when considered in connection with the accompanying drawing, wherein

Fig. 1 is a fragmentary plan view of an apparatus representing one embodiment of the invention whereby the improved method of continuously applying filling material may be effectively practiced, the evacuating and material filling pipes being broken away to disclose parts otherwise hidden;

Fig. 2 is a central vertical sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary detailed view showing a preferred form of a loaded conductor, and

Fig. 4 is an enlarged transverse sectional view of the loaded conductor with the semi-fluid material applied thereto taken on the line 4—4 of Fig. 3.

Referring now to the drawings wherein like numerals have been employed to designate similar parts throughout the various figures, it will be observed that Figs. 1 and 2 disclose a vacuum chamber 10 within a cylindrical casing 11, the chamber 10 communicating with an exhausting mechanism (not shown) through an evacuating pipe 12. The casing 11 is designed to permit the passage or drawing of a loaded conductor 14 through the chamber 10, and stuffing boxes 15 and 16 are provided at opposite extremities of the casing 11 to seal the chamber 10. To more effectively seal the chamber 10 during the evacuation thereof a pair of spaced resilient disks 18 is provided, these disks being separated by means of a sleeve 19 which cooperates with a threaded tightening nut 20 to

secure the disks 18 within the chamber. From the foregoing it will be apparent that when the conductor 14 which may comprise a stranded conductor core 22 surrounded by spiraled loading material or tape 23 is introduced within the evacuating chamber 10, the spaces or interstices between the turns of the spiraled loading tape 23 as well as between the loading tape and the core 22 will be evacuated. After the conductor 14 has been subjected to rarefied conditions within the chamber 10, it is passed through a tube 24 formed integral with the casing 11 and into a second evacuating chamber 26.

This evacuating chamber 26 is formed within a housing 27 which is provided with a cover plate 28 and serves as a means in addition to the chamber 10 for exhausting all of the conductor interstices. A vertical partition 29 located medially and extending transversely of the housing 27 separates the vacuum chamber 26 from a liquid retaining chamber 30. The chambers 26 and 30 communicate with an exhausting mechanism (not shown) through the medium of evacuating pipes 31 and 32, respectively, and a funnel device 34 is provided for supplying the chamber 30 with semi-fluid pressure equalizing material 35. The flow of fluid material 35 from the hopper funnel 34 may be controlled by employing a valve 36 which is interposed between the funnel and the chamber 30. To readily observe the position of the fluid level within the chamber 30, a transparent glass plate 38 is employed which is removably secured to the cover plate 28 by means of an annular clamping member 39. The clamping member 39 and its associated glass 38 may be readily removed so as to expose the chamber 30 to the atmosphere. When the loaded conductor 14 passes from the chamber 26 into the fluid 35 within the chamber 30, said fluid will readily flow into the exhausted spaces or interstices between the individual turns 22 and the spaces between the conductor core 22 and the turns 23 as clearly shown in Fig. 4. Thus it will be apparent that semi-fluid material 35 surrounding the conductor core 22 will serve as a pressure equalizing means for the spiral loading material or tape and as the conductor passes from the chamber 30 into a restricted conduit 40 a coating of material 35 will be applied externally of the turns of the loading material 23.

From this restricted conduit 40 the conductor 14 which is now supplied with the semi-fluid material 35 which completely fills all of the spaces between the conductor parts is carried into association with an extruding mechanism denoted generally by the numeral 42. This extruding mechanism 42 is similar in design to the mechanism disclosed in the application of Charles Martell and Berger Amandus Hagen, Serial No. 197,409, filed June 8, 1927. A supply of insulating ma-

terial 43 such as gutta percha is continuously supplied to the extruding mechanism 42 and as the conductor 14 and its applied coating of semi-fluid material passes through a series of nozzles or dies provided in the extruding mechanism 42, a coating of insulating material is uniformly applied to the conductor.

From the foregoing it will be clear that by the practice of this improved method a semi-fluid impregnating or filling material such as a liquid bitumen may be continuously applied to a continuously loaded conductor or cable so as to positively fill all of the spaces or interstices between the conductor or cable parts and to form a coating of semi-fluid material of desired thickness on the outside of the loading tape which will serve as a reservoir of such material throughout the length of the cable. Filling the interstices with the semi-fluid material as described causes the material to serve as a means for separating the loading tape and the conductor and thereby equalizes or uniformly distributes pressures which are incident to the use of submarine cables under deep-sea conditions. It will be observed that this method may be practiced without the use of fluid pumps for the purpose of forcing such fluid into the interstices around the conductor core and enables the application of semi-fluid, impregnating material by passing a loaded conductor through a supply of such material which is free from pressures in excess of atmospheric pressures. In fact the method may be practiced wherein the supply of semi-fluid material is under the pressures which are less than atmospheric pressures and this is accomplished by evacuating the air above the supply of fluid material. By evacuating the air above the fluid material any air bubbles entrapped within the fluid will be removed and by having the pressure within the chambers 26 and 30 substantially equal, the fluid material 35 will not flow into the chamber 26 between the surface of the conductor 14 and the surface of the aperture within the partition 29 through which the conductor passes. A valve 45 provided in the evacuating pipe 32 serves to disconnect the chamber 30 from the evacuating source when desired.

Although the invention has been described in connection with the application of semi-fluid material to a conductor having a covering of spiral loading material or tape, it is to be understood that the invention is capable of many other applications and therefore should be limited only by the scope of the appended claims.

What is claimed is:

1. The method of continuously applying semi-fluid material to a conductor, which consists in passing the conductor continuously through an evacuated area, then continuously passing the conductor through a second

evacuated area, and through a semi-fluid material adjacent to the second evacuated area, and reducing the pressure upon the semi-fluid material to prevent said material from

5 flowing into the second evacuated area.

2. The method of continuously applying semi-fluid material to a conductor, which consists in passing the conductor continuously through an evacuated area and through a

10 semi-fluid material adjacent to the evacuated area, and reducing the pressure upon the semi-fluid material to prevent the material from flowing into the evacuated area.

3. In an apparatus for continuously applying material to a core having interstices to be filled, means for continuously receiving and evacuating the interstices of the core, a second evacuating means connected with the first mentioned means for receiving a core

20 therefrom, a container communicating with the second evacuating means for receiving the evacuated core and for retaining impregnating material, and means for maintaining the material under a pressure less than atmospheric pressure to prevent the material from flowing into the second evacuating means.

4. The method of continuously applying semi-fluid material to a conductor core surrounded by turns of a loading material, which consists in continuously passing the loaded core through an evacuated area to evacuate the spaces between the core and the turns, continuously passing the loaded core

35 through a second and independent evacuated area to further evacuate the spaces between the core and the turns, continuously passing the loaded conductor through a semi-fluid material adjacent to the second evacuated area, and reducing the pressure upon the semi-fluid material to prevent the material from flowing into the second evacuated area.

5. In an apparatus for continuously applying material to a core having interstices to be filled, a plurality of independent evacuating chambers for evacuating the interstices in the core, means for connecting the chambers to permit the passage of the core from one chamber to another without exposure to the air, and a container for receiving the evacuated core and for retaining filling material, and means for evacuating the container to reduce the pressure upon the material below atmospheric pressure.

55 6. In an apparatus for continuously impregnating a conductor having a covering of loading material, a sealed evacuating chamber for receiving a loaded conductor and for evacuating the interstices between the conductor and the loading material, a second sealed evacuating chamber for receiving the conductor from the first mentioned chamber and for further evacuating the loaded conductor, a material containing chamber communicating with the second evacuating

chamber for receiving the evacuated conductor and for retaining impregnating material through which the evacuated conductor may be advanced, and means for evacuating the last mentioned chamber to prevent the flow of impregnating material therefrom into the preceding evacuating chamber.

In witness whereof, we hereunto subscribe our names this 13th day of August A. D. 1927.

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