Feb. 20, 1934. H. M. LARSEN 1,947,476

APPARATUS FOR TREATING MATERIALS

Original Filed Jan. 31, 1927

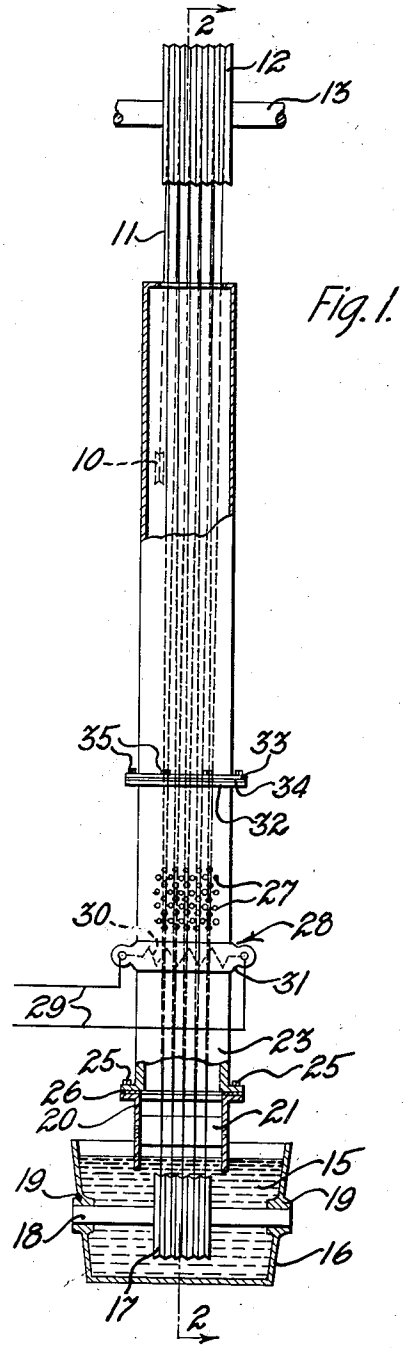


Fig. 1.

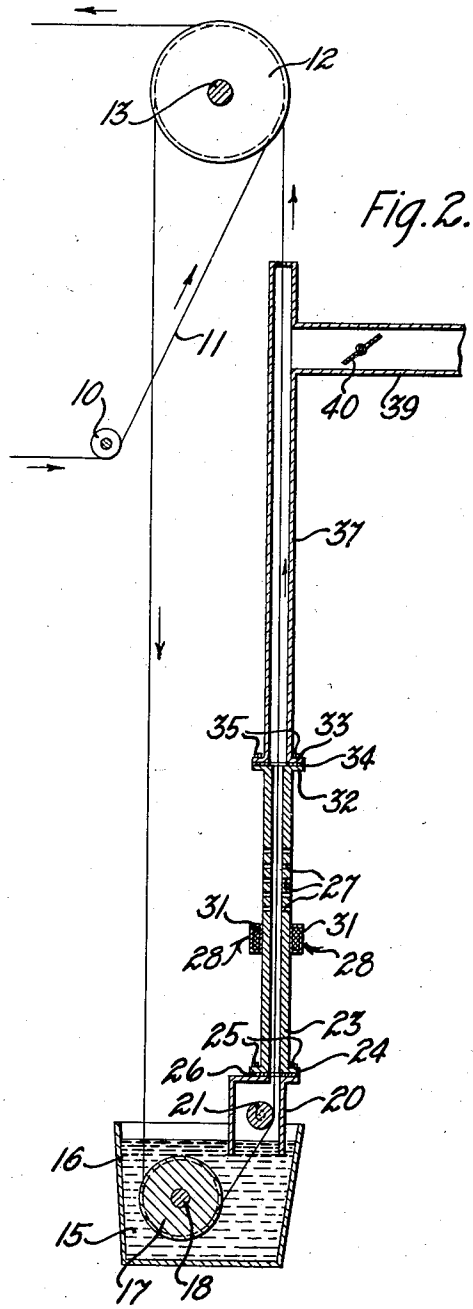


Fig. 2.

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Patented Feb. 20, 1934

1,947,476

UNITED STATES PATENT OFFICE

1,947,476

APPARATUS FOR TREATING MATERIALS

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Application January 31, 1927, Serial No. 164,995
Renewed April 15, 1932

7 Claims. (Cl. 91—55)

This invention relates to apparatus for treating materials, and more particularly to an apparatus for treating material applied to a core in strand form.

The object of the invention is the provision of a simple and effective apparatus for hardening material applied to a core in strand form.

In one embodiment of the invention, a wire is passed through a composition composed of a substantially non-volatile insulating material combined with suitable volatile, combustible substances whereby a coating adheres to the wire. As the wire emerges from the compostion it is passed through a substantially oxygen-free zone which is heated by an improved heating means comprising a tube heated by conducted heat and by electrical means where some of the substances are vaporized to render them more inflammable. The coated wire next passes through a zone where air is admitted and the vapors are ignited, whereupon the insulating material is baked or hardened upon the wire by the heat of combustion of the combustible substances in the coating composition.

It is believed that the invention will be clearly understood from the following detailed description and accompanying drawing illustrating one embodiment of the invention, and in which

Fig. 1 is an elevational view partially broken away of an insulating device, and

Fig. 2 is a vertical sectional view thereof taken substantially on line 2—2 of Fig. 1.

The accompanying drawing, in which like numerals designate like parts throughout the several views, illustrates an apparatus for insulating wires of relatively great length which is an improved and simplified form of the apparatus disclosed in the copending application, Serial No. 151,624, filed November 30, 1926, by H. M. Larsen and which is related to the copending application, Serial No. 164,894, filed Jan. 31, 1927, by F. Martindell. In this embodiment of the invention there is provided a sheave 10 around which a wire 11 which is to be insulated passes from a supply reel (not shown) to a large cylindrical grooved pulley 12 fixedly mounted upon a shaft 13 which is driven in any suitable manner. The wire 11 passes over and around the pulley 12 and then downwardly into an insulating composition 15 contained in a vessel 16 in which is mounted a cylindrical grooved pulley 17 upon a shaft 18 which is rotatably secured in bearings 19—19 provided in the walls of the vessel 16. Suspended within the composition contained in the vessel 16 is a chamber 20 in which is mounted a roller 21 for removing any excess composition from the wire and having a slot in the top thereof communicating with a heating and combustion tube 23 which is secured thereon in any suitable manner, such as by a flange 24 and bolts 25—25. An insulating gasket 26 is inserted between the box 20 and the tube 23 to prevent conduction of heat from the tube to the box.

The tube 23 is provided at a point intermediate its ends with a plurality of openings 27—27 and immediately below the openings is mounted a pair of electrical heating units 28—28 which are connected to a suitable source of electrical supply (not shown) by conductors 29. The heating units 28—28 may be of any suitable type, those illustrated comprising resistance elements 30—30 surrounded by a heat conducting insulating medium and retained in casings 31—31. The tube 23 is constructed of a material having a high thermal conductivity, such as brass, and the sides thereof are relatively thick so that heat generated by combustion in the tube above the openings 27—27 will be conducted downwardly by the tube 23 toward the box 20.

Secured upon the upper end of the heating and combustion tube 23 by any suitable means, such as flanges 32 and 33, between which is inserted a heat insulating gasket 34, and bolts 35—35, is a second tube 37 having an internal cross-sectional area larger than that of the heating tube 23. The tube 37 is made with a larger internal cross section than the tube 23 principally so that any soot produced by the combustion in the tube 23 which collects in the tube 37 will not contact with the wire passing therethrough. The tube 37 is provided near its upper end with a flue pipe 39 having a damper 40 of any suitable type rotatably mounted therein.

The operation of the apparatus is as follows: The wire 11 is passed from a suitable supply spool (not shown) around the sheave 10, over the pulley 12, down and around the pulley 17, over the roll 21, through the tubes 23 and 37, around the pulley 12, again down and around the pulley 17, and through the tubes to the pulley 12. The wire is threaded around the various pulleys in this way several times, in the embodiment shown, five times, and the last pass is drawn from the pulley 12 to a take-up device of any suitable type (not shown).

The vessel 16 is filled with an insulating composition consisting of a substantially non-volatile insulating material combined with any suitable volatile and combustible solvent or solvents, to a level above the lower end of the box 20. By the

term "solvent", as used above and hereinafter in the specification and annexed claims, is meant any substance which will combine with the insulating material to form a true solution, an emulsion, a suspension or a mixture of any of these states of matter. An insulating composition which may be employed with satisfactory results is disclosed in the United States Patent No. 1,101,281, issued June 23, 1914, to H. B. Holmes et al., with the exception that the carbon tetrachloride contained therein may be omitted in order to increase the inflammability of the solvents. This composition with the carbon tetrachloride omitted comprises substantially 158 pounds of low grade or pitchy ozocerite, 16.5 pounds of commercially pure ozocerite, 11.5 gallons of castor-oil, 36.5 gallons of mineral oil of a specific gravity of .860, 19.5 gallons of asphaltum, 1 pound of glue, 40 gallons of turpentine and 42 gallons of kerosene. The supply of current to the electric heating units 28—28 is turned on and the mechanisms driving the take-up device and the pulley 12 are started when the wire 11 will be drawn through the insulating composition 15 and become coated thereby. The strand of the wire passes from the composition directly into the chamber 20 without access to the air and around the roller 21, where, by the wiping action of the roller, any excess of insulating composition is removed. The coated strand then passes upwardly through the tube 23 which is heated by the electric heating units 28—28 to cause some of the volatile, combustible substances present in the coating on the wire to vaporize. Since the lower end of the chamber 20 dips into the coating composition forming a seal and the vapors produced in the heated zone of the tube 23 are burned above, the portion of the apparatus below the openings 27—27 is substantially oxygen-free. The coated wire next travels past the openings 27—27 in the tube 23 where a supply of air sufficient to burn substantially all of the solvents in the coating is admitted and mixes with the vapors produced below. These vapors are then ignited by any suitable means, such as by inserting a lighted torch through one of the openings 27—27 or by impinging a gas flame against the tube 23 adjacent the openings 27—27, whereupon the solvents upon the portion of the wire at that instant passing the openings 27—27 in the tube 23 become ignited. After the device has been operated for a short time the tube 23 is heated by the combustion of the solvents and due to the conductivity of the material of which the tube is made, a large portion of the heat is conducted downwardly toward the chamber 20, the insulating gaskets 26 and 34 preventing the heat leaving the ends of the tube by conduction. The heat thus conducted is utilized to vaporize a portion of the solvents in the coating on the wire below the openings 27—27 so that after the tube 23 has attained its maximum temperature, the supply of current to the heating units 28—28 may be reduced and the device then operates with a very little input of external heat. The damper 40 is adjusted so that the flame produced by the combustion of the solvents is of a height which gives a satisfactory product. Substantially all of the solvents in the coating upon the wire are burned in the portion of the tube 23 adjacent and directly above the openings 27—27 and sufficient heat is generated near the openings to bake the insulation firmly upon the wire. The wire now coated with a hard insulating substance passes upwardly through the tube 37 and through the hot products of combustion therein which are generated in the tube 23 whereby any remaining solvents in the coating are driven off and the insulating material is completely hardened on the wire. The wire is then passed over the pulley 12 and again through the above outlined steps to add another coating of insulating material upon the wire and the wire is repassed through the apparatus until the insulating coating thereon has assumed a thickness sufficient for the use to which the wire is to be put.

What is claimed is:

1. In a wire enameling apparatus, means for coating a wire with an insulating material combined with volatile, combustible solvents, a vertical heat conducting combustion chamber provided with a plurality of air ports, means for conveying the coated wire through the chamber, heat insulating means separating said chamber from the remainder of the apparatus and electric heating means below the ports for vaporizing a portion of the solvents on the wire to render them more inflammable, the combustion chamber conducting heat below the ports when the solvents are burned therein to harden the insulation upon the wire, which heat also vaporizes a portion of the solvents.

2. In a wire enameling apparatus, means for coating a wire with an insulating material combined with a volatile, combustible solvent, and an elongated chamber having a combustion zone near the upper end thereof for burning the solvent upon the wire, the chamber walls being composed of a high heat conducting material of sufficient thickness for conducting a substantial amount of the heat generated in the combustion zone to a point below that zone to vaporize a portion of the solvent.

3. In a wire enameling apparatus, means for coating a core with an insulating material combined with a volatile combustible solvent, a vertically disposed brass tube having relatively thick walls forming a heating and combustion chamber and provided with a plurality of air ports, heat insulating means separating said tube from the remainder of the apparatus, means for conveying the coated wire through the chamber, a plurality of electrical heating units positioned below the ports and closely adjacent the chamber for vaporizing a portion of the solvent on the wire, and a tubular member positioned above the chamber and communicating therewith.

4. In a wire enameling apparatus, a tube having walls in close proximity to the wire being enameled, the upper portion of the tube having a plurality of apertures for admitting air and forming a combustion chamber, the walls of the tube being composed of a high-heat conducting material of such thickness that the lower portion of the tube receives a substantial amount of heat by conduction from the upper portion and forms a vaporizing chamber, and means for supplementing the heat conducted to the vaporizing chamber from the combustion chamber.

5. In a wire enameling apparatus, a tube having walls in close proximity to the wire being enameled, the upper portion of the tube having a plurality of apertures for admitting air and forming a combustion chamber, the walls of the tube being composed of a high heat-conducting material of such thickness that the lower portion of the tube receives a substantial amount of heat by conduction from the upper portion and forms a vaporizing chamber, and a baking chamber above the combustion chamber having walls

spaced farther from the wire being enameled than the walls of the combustion chamber, whereby the tendency of the products of combustion collecting on the wire is minimized.

6. In a wire enameling apparatus, means for coating wire with an insulating material combined with a volatile combustible solvent, and an elongated tubular member through which the wire passes and which has a combustion chamber near the upper end for burning the solvent carried into the tubular member by the wire, the walls of said tubular member below the combustion chamber being composed of a high heat-conducting material of sufficient thickness to facilitate the conduction of a substantial quantity of heat downwardly for vaporizing the solvent.

7. A wire enameling apparatus including means for coating a wire with an enamel comprising a substantially non-volatile, non-combustible substance combined with a volatile, combustible solvent, a tube forming a baking chamber adjacent its upper end, and a vaporizing chamber adjacent its lower end, said tube having walls in close proximity to the wire being enameled, said walls being composed of a high heat-conducting material of sufficient thickness to conduct a substantial quantity of heat from the baking chamber to the vaporizing chamber, and electrically operated means mounted on said tube adjacent the vaporizing chamber for supplementing the heat supplied by conduction from the baking chamber to vaporize the solvent.

HENRY MARTIN LARSEN.