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S. S. SHERRILL ET AL

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COATING APPARATUS

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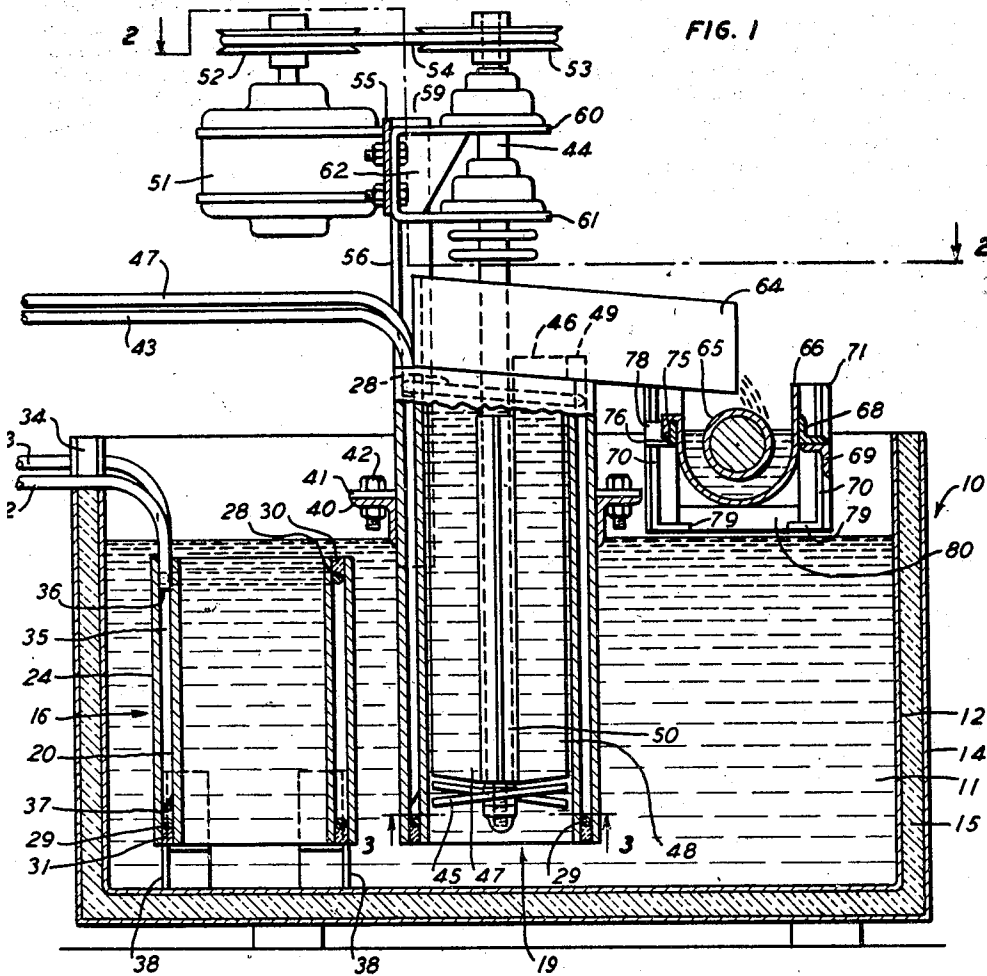
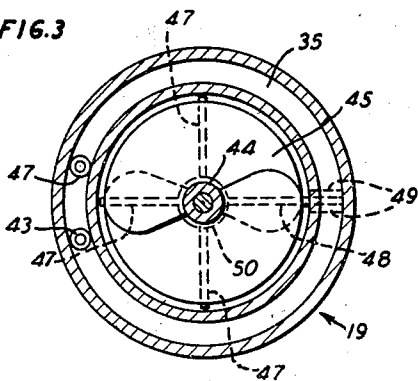


FIG. 3



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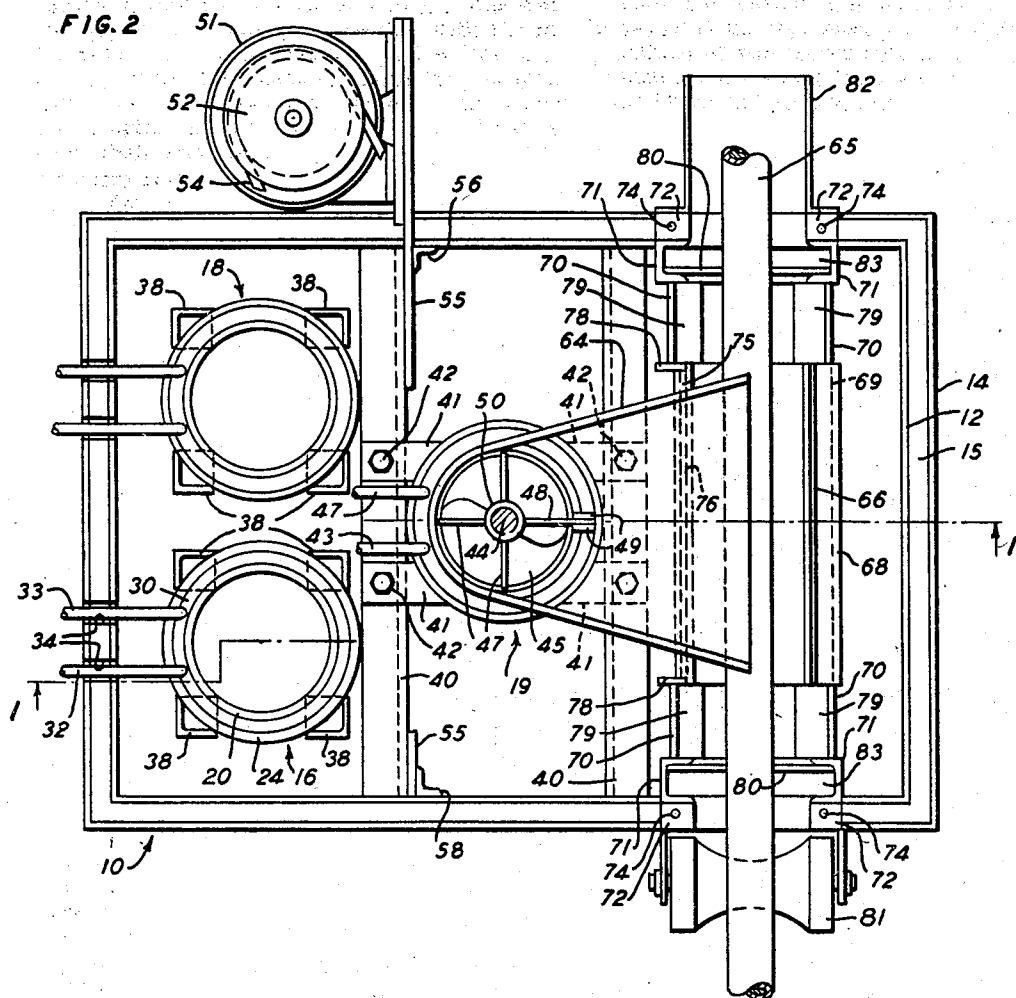
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COATING APPARATUS

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16 Claims. (Cl. 91—43)

This invention relates to coating apparatus and more particularly to apparatus for continuously applying heavy viscous coating materials to electrical cables.

Tar, paraffin and similar materials are frequently applied to electrical cables for the purpose of water proofing them. Coating materials of this type are usually heavy and highly viscous, and have to be heated in order to liquify them preparatory to using them as a coating material. One type of apparatus in common use for applying such a coating material comprises a steam jacketed tank made of cast iron for containing the coating material. An applicator of suitable design for applying the coating material to an article to be coated is positioned in the tank. One type of applicator which has been used consists of a horizontal, rotatable cylinder partially immersed in the coating material which picks up the material as it rotates and carries it to an applicator.

The cast iron jackets used in this type of apparatus are very expensive and crack frequently due to heat and pressure strains. Also the bottom of the container becomes thickly encrusted with matter which can be cleaned off only by shutting down the entire line of operations of which the coating applying step forms a part, and draining all of the coating material therefrom. The pressure of the steam used to heat the cast iron jacket is limited by the construction of the cast iron tank and is capable of being increased to suit certain requirements only by adding a number of staybolts or increasing the ribbing and the thickness of the cast iron used, all of which entails much expense and increases the possibility of leaks.

In some instances these expensive cast iron jackets have been obviated by the use of steam coils placed in the coating material to heat it. While diminishing the cost of the apparatus, the use of steam coils does not obviate the necessity of a shut down of the entire line of operations of which the coating step is a part every time the coating apparatus requires cleaning. Furthermore, because of the inaccessibility of the large horizontal areas of the heating coils, cleaning them is a long and difficult task.

Moreover, when the cylinder type coating material pick-up referred to hereinabove is employed, the bearings of the cylinder come in contact with the coating material and may be injured by the heat of and foreign matter present in the coating material. The greatest danger from this source is that the bearing will freeze

in the heavy liquid after an overnight shut-down, and the driving motor will be unable to turn the shaft and consequently burn out.

Doctor blades are usually provided to scrape the coating material from the cylinder in the cylinder type pick-up. Should there be even a slight crack in the cylinder's surface, the doctor blade may catch in it and split the cylinder, thus requiring a shut-down until the necessary repairs are made.

These and numerous other disadvantages made the above described apparatus very unsatisfactory, and resulted in applicants' present invention which comprises a coating apparatus that is cheap to manufacture, economical to run and superior in performance to devices previously known and used.

An object of applicants' invention is to provide a coating device for coating articles which is of simple construction and is dependable in operation.

In general applicants' device comprises a container for the coating material, a plurality of annular cylindrical heating units removably positioned in the container and having the major portion of their heating surfaces disposed vertically. Pumping means including an impeller are mounted within one of the heating units for forcing the coating material through the heating unit and onto the article to be coated.

Other objects and features of the invention will be apparent from the following detailed description taken in conjunction with the accompanying drawings, wherein

Fig. 1 is a vertical sectional view, partly in elevation, of a coating device embodying the invention taken on the line 1—1 of Fig. 2;

Fig. 2 is a horizontal sectional view of the coating device taken on the line 2—2 of Fig. 1, and

Fig. 3 is horizontal sectional view of a heating cylinder forming a part of the coating device, taken on the line 3—3 of Fig. 1.

In the drawings a container is indicated at 10 for containing a quantity of coating material 11. This coating material may be of any usual type, but in the present embodiment of the invention it is a heavy, viscous fluid used for water-proofing electric cables. The inner and outer walls 12 and 14, respectively, of the container 10 are constructed of thin metal and are separated by an insulating material 15. Such a container is in no way subject to injury due to heat variations, as is a cast iron tank.

Two annular, cylindrical heating units 16 and

18 are located within the container 10. The unit 16 is constructed by positioning an inner metal casing 20 within an outer metal casing 24. The casings are properly spaced by means of metal rings 28 and 29 (Fig. 1) welded in place near the top and bottom of the casings by welds 30 and 31, respectively (Fig. 1), which are even with the ends of the casings. The walls 20 and 24, together with the rings 28 and 29 and welds 30 and 31, form a steam chamber 35 for heating the walls 20 and 24. The hollow walled, annular cylinder thus created has smooth vertical surfaces both inside and out, which have little tendency to collect the coating material.

A steam supply pipe 32 and a condensate return pipe 33 enter the container 10 through slots 34—34 and extend into the steam chamber 35 through holes bored in the ring 28. The end 36 (Fig. 1) of the supply pipe 32 which is within the chamber 35 is located only a short distance below the top of the chamber, while the end 37 of the return pipe 33 is located near the bottom of the chamber 35. Thus the pressure of the steam entering the chamber 35 from the supply pipe 32 forces the condensate collecting at the bottom of the chamber 35 out of the chamber through the return pipe 33.

The heating unit 16 rests upon supports 38—38 which are disposed around the circumference of its lower end in such a manner as to provide a certain amount of clearance between the lower end of the unit and the bottom of the container 10.

The heating unit 18 and the supports therefor are identical in construction with the previously described heating unit 16 and supports 38—38. The heating unit 18 is also provided with a steam supply pipe and a return pipe like the pipes 32 and 33 described in connection with the heating unit 16.

A third heating unit 19 is positioned centrally within the container 10. The unit 19 is similar in construction to the units 16 and 18, but is somewhat longer than those units and is supported in a different manner. The unit 19 is provided with a steam supply pipe 43 and condensate return pipe 47, which function like the pipes 32 and 33 described hereinabove.

The heating unit 19 is supported by angle bars 40—40 welded at their ends to the sides of the container 10. Lugs 41—41 which are welded to the heating unit 19, are fastened by bolts 42—42 to the angle bar supports 40—40, so that the heating unit 19 is spaced from the bottom of container 10. The spacing of all of the heating units from the bottom of container 10 is necessary in order to permit the coating liquid to circulate freely through the units.

Mounted on a shaft 44 disposed centrally of the heating unit 19 is a two bladed impeller 45 which is positioned near the lower end of the heating unit 19. Three identical vanes 47—47 (Fig. 3) and a vane 48 having a projecting end portion 46 extending over the top of the heating unit 19 are secured to a tube 50 which surrounds the shaft 44. Lugs 49—49 which are welded to the heating unit 19 on its upper horizontal periphery retain the extended end portion 46 of the vane 48 so as to prevent rotation of the vanes. The purpose of these vanes is to translate the horizontal rotational movement given to the coating material 11 by the impeller 45 into a vertical movement up through the heating unit 19.

A pulley 53 (Fig. 1) is mounted upon the upper extremity of the shaft 44 and is driven by a motor

51 through a pulley 52 and belt 54. Should the impeller 45 for any reason be unable to rotate, the belt 54 will slip sufficiently about the pulley 53 to prevent the motor 51 from burning out. The motor 51 is supported by a base plate 55 extending the width of container 10 and in turn supported by angle bars 56 and 58 (Fig. 1). A U-shaped support 59 is bolted to the base plate 55 and has arms 60 and 61 which serve both to support the impeller assembly and to align the impeller shaft 44. Brackets 62—62 strengthen the arms 60 and 61 against horizontal displacement.

The pump in the particular embodiment of the invention described has no bearings in the coating material and thus is not subject to the objections raised against the prior art apparatus, which have bearings in the coating material. Moreover, impellers of the type used in these pumps are cheap and easy to replace. This type of pump is also advantageous in that it pumps the fluid with a minimum amount of turbulence so that the safety hazard of splashing hot liquid is lessened.

A conduit 64 fits over the top of heating unit 19 in such a manner as to receive the hot coating material pumped up through the unit 19 by the impeller 45. The conduit 64 is inclined slightly downward and directs the coating material upon an electrical cable 65 which may be advanced through the apparatus by any suitable means (not shown). The cable 65 passes through a trough 66 which retains a sufficient quantity of coating material to coat the under side of the cable 65. The trough 66 is supported on one side by an angle bar 68 welded horizontally along that side and resting upon another angle bar 69 (Fig. 1) attached at opposite ends to L-shaped members 70—70. Each L-shaped member 70—70 is in turn attached to a U-shaped member 71—71 which is attached to member 72—72 (Fig. 2) that rests upon the upper edge of the container 11. Pins 74—74 (Fig. 2) secured upon the members 72—72 enter aligned openings in the container 10 to prevent lateral movement of the trough 66. The opposite side of the trough 66 is bent outwardly and downwardly as shown at 75 over a bar 76 (Fig. 1). The bar 76 is bent outwardly at either end to form lugs 78—78 which are welded to the L-shaped members 70—70, these last named members connecting with the container 10 as above described.

Arms 79—79 of the L-shaped members 70—70 support a wiper assembly (not shown) which may be of any suitable construction. A bar 80 connects opposing U-shaped members 71 and this aids in stabilizing the trough supports. An opening 83—83 (Fig. 2) is left at each end of the trough 66 between the members 71—71 to permit the coating liquid 11 to overflow from the trough 66 back into the container 10, thus providing constant circulation of the coating liquid 11 between the container 10 and the trough 66.

A roller 81 (Fig. 2) supports the cable before it enters the container 10 and a trough 82 is provided at the cable exit to catch any of the coating material 11 which may drip from the cable or wiper.

In operation a suitable coating material 11 is supplied to the container 10 in any known and convenient manner. The level of the coating material 11 in the container 10 is kept above the upper edge of the heating units 16 and 18. Steam supplied through pipes 32 and 43 heats the heating units 16, 18 and 19, and convection currents of coating material are set up within the units

which provide effective circulation of the material. The impeller 45 forces the heated coating material up through heating unit 18 and onto the conduit 64 which directs the coating material onto the cable 65. The trough 66 is partly filled so as to fully coat the cable 65, by supplying the coating material 11 to the conduit 64 at the rate necessary to coat the cable 65 and provide a constant overflow from trough 66 back into the container 10 through the openings 83—83 at either end of the trough formed between the U-shaped members 71—71.

The cable 65 passes over the roller 81 and through the trough 66 wherein it receives a coating of material 11. Wipers (not shown) remove the excess coating from the cable which then exits through a trough 82 designed to catch drippings of the coating material 11 from the cable 65.

Whenever the container is to be cleaned, pipes 32 and 33 leading to the heating units 16 and 18 are detached from the main steam supply and condensate return pipes (not shown) and the heating units 16 and 18 are lifted out. The impeller assembly may be lifted out merely by slipping belt 54 off of pulleys 52 and 53 and unbolting the U-shaped support 59 from base plate 55. After removal of the impeller assembly, unbolting the bolts 42—42 will permit the heating unit 19 to be lifted out, along with the conduit 64. The trough assembly comprising members 66 through 72 merely rests upon the edge of the container 10 and may be lifted out.

The container 10 may now be easily and thoroughly cleaned in a very short time. Such a thorough cleaning is not required very often and usually removal and cleaning of the heating units 16 and 18 is all that is required. These units can be removed while the device is in use without materially interfering with its operation.

The extremely small horizontal surface of the heating units collects very little residual matter and the units may operate for an extensive period of time without requiring cleaning. Another factor facilitating the cleaning of the heating units is their smooth vertical surfaces, which may be easily cleaned with a wire brush. Thus, the delay due to draining the compound in order to clean the container or heating coils in the old type devices has been entirely eliminated.

Numerous changes may be made in the embodiment shown of applicants' device without departing from the spirit of the invention. The shape of the heating units, the type of blades on the impeller, the trough arrangement, the wiper assembly, etc., may all be varied within wide limits. Therefore, the invention is to be limited only by the language of the annexed claims.

What is claimed is:

1. In a coating apparatus, a container for coating material, means for heating coating material held in the container comprising a plurality of heating units each of which is composed of an annular, hollow walled cylinder having smooth surfaced walls, and a pump for forcing the coating material through the central opening of one of the heating units.

2. In a coating apparatus, a container for coating material, means for heating the material comprising a plurality of separate heating units, each of which is removably mounted in the container and at least one of which is an annular cylinder, a pump for forcing the coating material through the central opening of the annular, cylindrical heating unit, and means for receiving

the pumped material for application to an article.

3. In a coating apparatus, a tank for containing coating material, means for heating the material comprising an annular, vertical cylinder, means for internally heating the walls of the heating means, said cylinder being removably mounted in the tank, and means for causing the coating material to pass through the central opening of the cylinder and onto an article to be coated.

4. In a coating apparatus, a container for coating material, means for heating the coating material comprising an annular, vertical, hollow walled cylinder, said cylinder being freely mounted in the container, means for supplying a heating fluid to the hollow cylinder walls, means for applying the coating material to an article to be coated including a conduit for conveying the coating material from the top of the heated cylinder to the article to be coated, and means for circulating the coating material through the heating means and the applying means comprising a vane type pump having an impeller positioned within the central opening of the heating means and designed to pump the coating material to the top of the heated cylinder.

5. In a coating apparatus, a container for coating material, means for heating coating material within the container comprising an open-ended, annular cylinder removably positioned in the container and having smooth surfaced walls, means for internally heating the walls of the cylinder, means for applying the coating material to an article to be coated, and means for circulating the coating material through the cylinder and the applying means comprising a pump having a vane type impeller mounted within the central opening of said heated cylinder.

6. In a coating apparatus, a container for coating material, an open-ended, cylindrical, double-walled heating element positioned within the container, and a pump positioned within the central opening of said heating cylinder.

7. In a coating apparatus, a container for coating material, a heating unit comprising a smooth surfaced, elongated body having an aperture extending therethrough, said unit being removably positioned in the container and having means for heating the interior of the body, pumping means comprising an impeller positioned within the aperture in the body of the unit, and means for applying the coating material supplied by the pumping means to an object to be coated.

8. In a coating apparatus, a container for holding coating material, a plurality of annular, cylindrical heating elements removably positioned within the container, means for internally heating the walls of the heating elements, a pump having a vane-type impeller mounted within the annulus of one of the heating elements, means for applying the coating material to an article, and means for conveying the pumped coating material from the pump to the applying means.

9. In a coating apparatus, a container for the coating material, an open-ended cylindrical, double walled heating means positioned within the container, material applying means, and pumping means for forcing the coating material through the central opening of the heating means to the material applying means, all of above-mentioned means being removably positioned within the container.

10. In a coating apparatus, a container for the coating material, heating means comprising an annular open-ended cylinder, means for in-

ternally heating the walls of the cylinder, material applying means, and means comprising a vane-type impeller mounted within the central opening of the heating means for forcing the coating material through the heating means and to the applying means, all of the above-mentioned means being removably positioned within the container.

11. In a cable coating apparatus, a container for holding coating material, a plurality of annular cylinders removably mounted in the container, means for internally heating the walls of the cylinders, a vane-type pump mounted in the central opening of one of said cylinders for forcing coating material upward through said cylinder, material applying means, means for conveying the pump coating material from the top of said cylinder to the material applying means, and means for advancing a cable through the applying means.

12. In a cable coating apparatus, a container for holding coating material, a plurality of annular, hollow walled cylinders removably mounted in the container, means for supplying steam to the space between the cylinder walls, a vane-type pump mounted in the central opening of one of said cylinders for forcing coating material therethrough, material applying means comprising a trough removably mounted in the container and having openings at each end to permit the overflow of coating material from the trough to return to the container and a conduit for carrying coating material from the top of the cylinder in which the pump is located to the material applying means, and means for advancing a cable through the material applying means.

13. In a coating apparatus, a container for holding coating material, a plurality of annular, hollow walled heating cylinders positioned vertically within the container, means for freely supporting the heating cylinders with the lower ends thereof spaced from the bottom of the container, means for supplying a heating fluid to the space

between the walls of the cylinders, means positioned within the central opening of one of the cylinders for causing the coating material to pass upwardly therethrough, and means for receiving the material passed through the last mentioned cylinder for application to an article to be coated.

14. In a coating apparatus, a container for coating material, means for heating coating material within the container comprising a plurality of vertical, double walled tubes, means for heating the internal walls of the tubes, and means for forcing the coating material through the central opening of one of the heated tubes comprising a pump having an impeller positioned in said central opening, a frame, and a plurality of bearings carried by the frame for supporting the impeller, all of which bearings are free from contact with the coating material in the container.

15. In a coating apparatus, a container for coating material, a plurality of smooth surfaced tubes freely positioned within the container, means for internally heating the tube walls, a pump having an impeller mounted within one of the tubes, a frame, a plurality of bearings carried by the frame for supporting the impeller, all of which bearings are free from contact with the material pumped, means for applying the pumped material to an article and having an overflow directed into the container, and means for conveying the pumped coating material from the pumping means to the applying means.

16. In a coating apparatus, a container for coating material, an open-ended, annular cylinder, means for internally heating the walls of the cylinder, a pump having an impeller positioned within the cylinder, a frame, a plurality of bearings carried by the frame for supporting the impeller, all of which bearings are so positioned as not to contact the coating material, and means for applying the pumped coating material to an object to be coated.

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