Nov. 16, 1965 I. W. WADE, JR 3,218,187

COATING METHOD

Filed April 16, 1962

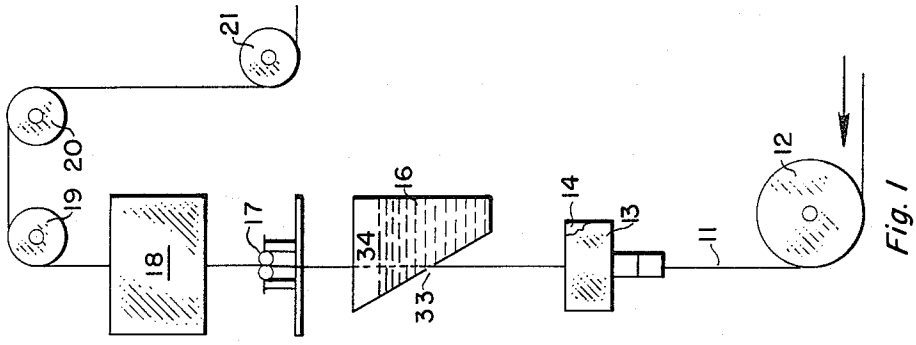


Fig. 1

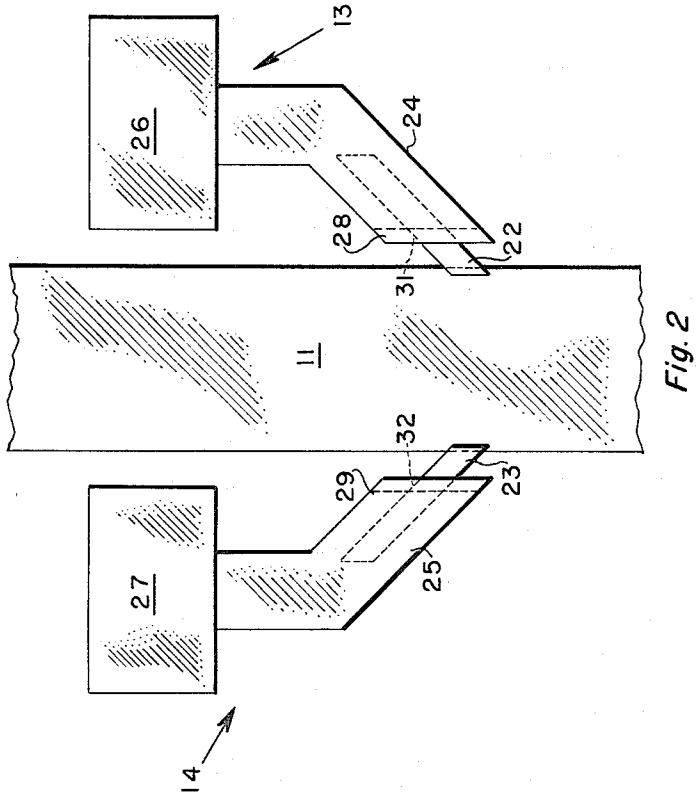


Fig. 2

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HIS AGENT

United States Patent Office 3,218,187 Patented Nov. 16, 1965

3,218,187

COATING METHOD

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Filed Apr. 16, 1962, Ser. No. 187,514
11 Claims. (Cl. 117—43)

My invention relates to the application of curable resinous coatings and particularly to the application of said coatings to narrow edges.

In the application of coatings it has always been difficult to obtain a coating of adequate thickness on objects having both broad surfaces and narrow edges since the coatings on the edges tend to drain off much more rapidly than the coatings on the surfaces. This problem is of particular concern when efforts are made to coat aluminum and copper strip conductors with resinous coatings for the purpose of electrical insulation. Particularly where the coated materials are to be used in electrical apparatus with no additional materials interleaved between the layers in the winding it is essential that the edges of the foil should be properly insulated as well as the broad surfaces, but no satisfactory method of assuring proper edge coating is known.

I have discovered that if the edges of the strip or other object to be coated are first wetted with a compound capable of accelerating the cure of the resinous material while the broad surfaces of the object are not so treated, the coating material does not drain from the edges during the coating operation and a satisfactory layer remains on the edges as well as the broad surfaces. I have invented the method of applying a coating of resinous material to an object having at least one broad surface and at least one narrow edge comprising the steps of coating the edge with an accelerator for the resinous material while maintaining the broad surface free from accelerator, covering both the surface and the edge with a layer of the resinous material and then hardening the material. Where the resinous material is thermocuring, the hardening step comprises heating the material to cure it.

My method is particularly adapted to resinous materials selected from the group consisting of epoxies, polyesters, urethanes, polyamides, polyimides and polyacetals, and most particularly to the epoxy resins. With regard to accelerator my method is particularly adapted to accelerators selected from the group consisting of nonylphenol, resorcinol, and triphenyl phosphite. Furthermore my method has special application to the coating of objects in the form of elongated strips such as metallic foils and particularly aluminum and copper. In a preferred method of application I feed my accelerator to a capillary applicator and wet the edge of the strip to be coated by applying the applicator to it. I then immerse the strip in a supply of the resinous material and deposit a coating on the strip and heat the strip sufficiently to cure the resin.

A more thorough understanding of my invention may be gained by a study of the appended drawing.

In the drawing:

FIGURE 1 is a schematic representation of the process of my invention.

FIGURE 2 is an enlarged detail of a step in the process of FIGURE 1.

Referring to the figures a foil strip **11** is guided over a roller **12** from a supply source, not shown, between applicators **13, 14**, through an enamel tank **16** metering die bars **17**, curing oven **18**, and guide rolls **19, 20, 21** to a take-up mechanism, not shown. Although I have shown the object to be coated as a foil strip **11** it will be appreciated that my invention is not limited thereto nor is it

limited to continuous processes but may be used to coat any objects which combine a broad surface and a narrow edge. The applicators **13, 14** are shown in greater detail in FIGURE 2 to comprise felt wipes **22, 23**. The wipes **22, 23** project from respective tubes **24, 25** connected to respective tanks **26, 27** holding a supply of accelerator in solution. The tubes **24, 25** are closed by plates **28, 29** to retain the fluid accelerator but the plates have openings **31, 32** which fit closely to the wipes **22, 23** and permit them to project through the plates **28, 29** to make a wiping contact with the strip **11**. Although I prefer to use felt wipes which have the ability to act as wicks because of their capillary structure, other capillary wipes such as sponges may also be used and, indeed, I do not want to be limited to any particular method of application so long as a coating of accelerator is applied to the narrow edge of the objects prior to enamelling. In the drawing the tanks **26, 27** are large enough to make it practicable to fill them by hand but it will be understood that the tubes **24, 25** might be automatically supplied from a remote source of accelerator solution without departing from by invention. The tank **16** has a slit **33** through which the strip **11** can enter and become coated with enamel **34**. The enamel **34** is relatively viscous so that it does not flow back through the opening **33** when the strip **11** is moving upward at operating speeds. Excess enamel is removed by the die bars **17** and in the oven **18** the enamel is cured so that there is no tendency for it to stick to the rolls **19, 20, 21**.

An enamel **34** for which my method is particularly adapted is an epoxy resin and the resins made by the Jones-Dabney Co. of Louisville, Ky., and known as Epi Rez 510, Epi Rez 504, and Epi Rez 507 are preferred examples and are cured by an amine agent in a known manner. Other curing agents are known for epoxy resins and my invention is not limited to the use of amines as curing agents. Other resinous materials can be used for the enamel **34** such as epoxies, polyesters, urethanes, polyamides, polyimides, and polyacetals. It will be understood that most of the resinous materials suitable for strip coating require the addition of curing agents and where reference is made to resins or resinous materials in this application it includes the curing agents where they are required. The accelerator in the tanks **26, 27** is preferably dissolved in a volatile solvent such as methyl alcohol. The dilution is sufficient to deposit the minimum quantity of accelerator that will produce the desired effect but should be sufficient to produce proper wicking in the capillary felts **22, 23**. I have found that nonylphenol, resorcinol, and triphenyl phosphite produce the desired effect and I particularly prefer resorcinol for my accelerator. However, with regard to accelerators my method is adapted to any compound or combination which has the effect of causing rapid curing of a particular coating.

Example

A 33% solution of resorcinol in methyl alcohol was applied to the edges of a foil at a distance of six inches below the enamelling tank. The foil was then coated with an enamel comprising 100 parts by weight of epoxy resin (Epi Rez 510) and 30 parts by weight of amine curing agent (Epi Cure 81 furnished by Jones-Dabney).

The enamelled strip of the example was compared to a control strip coated under identical conditions except for the omission of the resorcinol. Both strips were examined under a microscope and the strip of the example showed a definite increase in build-up of enamel on the edges, over the control strip. Dielectric strengths of the enamel on the edges of both strips were measured, with the results shown in Table I.

Table I

	Breakdown voltage
Strip of the example	350, 360, 370, 350, 370
Control strip	90, 0, 120, 200

The improvement in dielectric strength of strip coated in accordance with my invention is very striking as shown by Table I.

I have invented a new and useful method of applying resinous coatings for which I desire an award of Letters Patent.

I claim:

1. The method of applying a coating of thermocuring resinous material to an object having at least one broad surface and at least one narrow edge comprising the steps of first coating said edge with an accelerator for said material while maintaining said surface free from said accelerator, covering said surface and said edge with a layer of said material and heating said layer to cure said material.

2. The method of applying a coating of a resinous material selected from the group consisting of epoxies, polyesters, urethanes, polyamides, polyimides, and polyacetals to an elongated strip having at least one broad surface and at least one narrow edge comprising the steps of first coating said edge with an accelerator for said material while maintaining said surface free from said accelerator, covering said surface and said edge with a layer of said material and curing said material.

3. The method of applying a coating of epoxy resin to an elongated strip having at least one broad surface and at least one narrow edge comprising the steps of first coating said edge with an accelerator selected from the group consisting of nonylphenol, resorcinol, and triphenyl phosphite while maintaining said surface free from said accelerator, covering said surface and said edge with a layer of said resin and curing said resin.

4. The method of applying a coating of thermocuring resinous material to a metallic foil strip comprising the steps of coating at least one edge of said strip with an accelerator for said material, passing said strip through a supply of said resin said resin surrounding said strip and being in contact therewith whereby a layer of said material is deposited on said strip and heating said strip sufficiently to cure said material.

5. The method of applying a coating of thermocuring resinous material to a metallic foil strip comprising the steps of feeding an accelerator for said material to a capillary applicator, applying said applicator to an edge of said strip thereby wetting said edge with said accelerator, immersing said strip in a supply of said material whereby a coating of said material is deposited on said strip, and heating said strip sufficiently to cure said material.

6. The method of claim 5 wherein said material is selected from the group consisting of epoxies, polyesters, urethanes, polyamides, polyimides and polyacetals.

7. The method of claim 5 wherein said accelerator is selected from the group consisting of nonylphenol, resorcinol, and triphenyl phosphite.

8. The method of claim 5 wherein said strip is aluminum.

9. The method of claim 5 wherein said strip is copper.

10. The method of claim 5 wherein said material is epoxy resin.

11. The method of claim 10 wherein said material is epoxy resin and said accelerator is resorcinol.

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