July 3, 1951 H. W. STURGIS ET AL 2,558,993

APPARATUS FOR APPLYING VISCOUS COATING COMPOSITIONS TO WIRE

Filed Feb. 15, 1949

FIG. 1

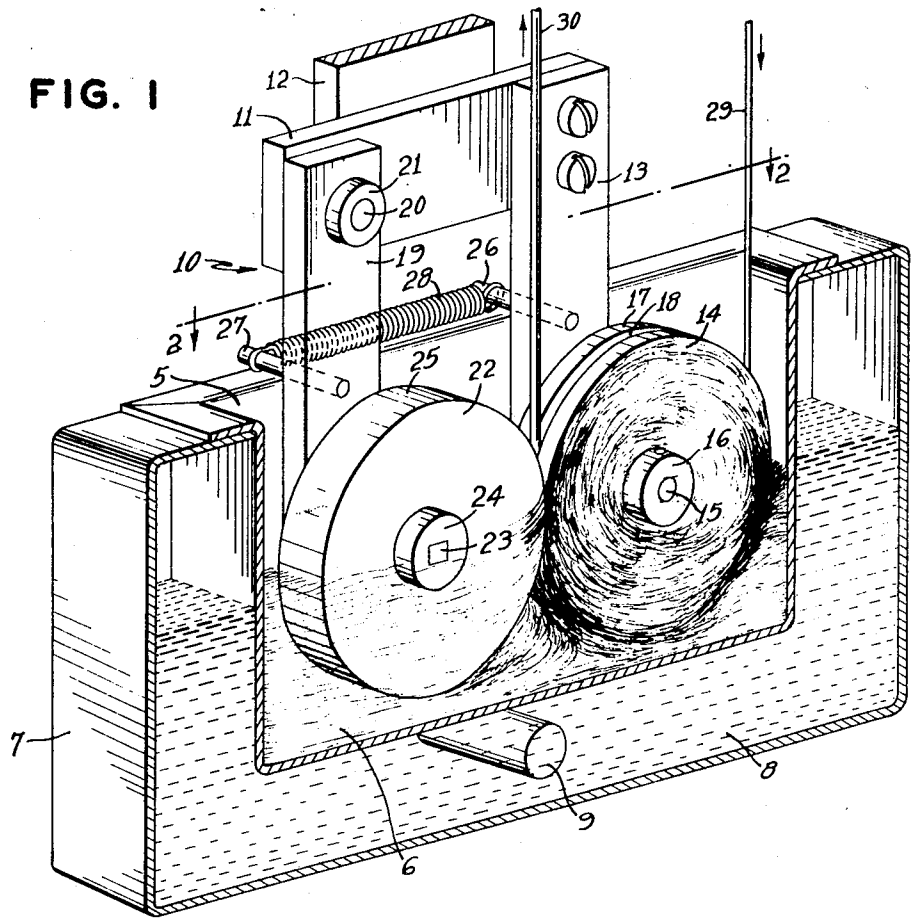
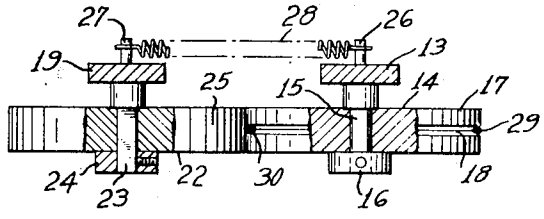


FIG. 2



INVENTORS
Howard W. Sturgis
Emil H. Olson

BY

Pennie Edmonds Morton & Barrows

ATTORNEYS

Patented July 3, 1951

2,558,993

UNITED STATES PATENT OFFICE

2,558,993

APPARATUS FOR APPLYING VISCOUS COATING COMPOSITIONS TO WIRE

Howard W. Sturgis and Emil H. Olson, Muskegon, Mich., assignors to Anaconda Wire and Cable Company, a corporation of Delaware

Application February 15, 1949, Serial No. 76,442

3 Claims. (Cl. 91—32)

1

This invention relates to apparatus for applying viscous coating compositions to wire, and is particularly concerned with the provision of an improved apparatus for applying viscous gelable lacquers to copper wire in the manufacture of insulated magnet wire.

The new apparatus comprises a vessel for containing the coating composition, and a rotatable wheel having a cylindrical face partially immersed in the composition. The cylindrical face of said wheel is formed with a peripheral groove for receiving a wire and guiding it down into and up again out of the coating composition. A wiper element having a cylindrically curved face of approximately the same radius of curvature as the rotatable wheel bears against the cylindrical face of said wheel about at the point where the wire emerges from the coating composition, the wiper element being restrained from rotation about the center of curvature of its face. The wiper element is advantageously in the form of a non-rotatable wheel fastened to an arm which in turn is pivotally mounted on the frame that carries the rotatable wheel. Spring means then are provided for urging the wiper supporting arm on its pivotal mounting toward the rotatable wheel, thereby to bring the curved face of the wiper element into engagement with the cylindrical face of the rotatable wheel.

A preferred embodiment of the invention is shown in the accompanying drawings, in which

Fig. 1 is a perspective, partly in section, of the new apparatus; and

Fig. 2 is a section taken substantially along the line 2—2 of Fig. 1.

The apparatus shown in the drawings comprises a vessel 5 containing a body of gelable lacquer 6. The vessel 5 is suspended in a jacket 7 containing a body of water 8 heated by a thermostatically controlled heater 9 to a temperature above the gelation temperature of the coating composition, whereby the coating composition is kept at the optimum temperature for application to a wire.

Suspended in the vessel 5 is an applicator 10 which serves to guide a wire into and out of the body of gelable lacquer 6, and to control the thickness of the coating of such lacquer that is formed on the wire. The applicator comprises a transverse frame member 11 fastened to a bar 12 by which the applicator is suspended in the vessel 5. A vertical frame member 13 is rigidly fastened to the transverse frame member 11 at one end thereof. A wheel 14 is rotatably mounted on a shaft 15 secured to the vertical frame member

2

13 near its lower end, and is held in place by a collar 16. The wheel 14 is formed with a cylindrical face 17 in which a peripheral groove 18 is cut.

An arm 19 is pivotally mounted, by means of a pivot pin 20 and retaining collar 21, on the transverse frame member 11. The arm 19 carries a wiper element 22 at its lower end. The wiper element is in the form of a wheel non-rotatably mounted on a pin 23 rigidly attached to the arm 19. The wheel is held in place by a collar 24. The pin 23 is shown as being rectangular in cross section, passing through a corresponding rectangular hole in the wiper 22, to prevent rotation of the wiper about the center of curvature of its face 25; but it is evident that other mechanical expedients than the rectangular pin 23 may be used to restrain the wiper from rotation.

The wiper element 22, like the rotatable wheel 14, is formed with a cylindrical face 25, and is mounted in such position that its face 25 may be swung by movement of the arm 19 against the face 17 of the rotatable wheel about at the surface level of the body of lacquer 6. Pins 26 and 27 are fastened to the vertical frame member 13 and to the arm 19, respectively, and a tension spring 28 engaging these pins urges the cylindrical face of the wiper element into contact with the cylindrical face 17 of the rotatable wheel 14.

Operation of the apparatus is as follows: A wire 29 to be coated is looped around the rotatable wheel, engaging in the peripheral groove 18 in the face thereof; and it is guided by the rotatable wheel down into the body of lacquer 6 and then up again out of the lacquer. In consequence of thus having been immersed in the body of lacquer, the emerging wire 30 is provided with a coating of the lacquer. The thickness of the coating on the emerging wire is limited by the action of the wiper element 22, which insures that the cross-sectional area of the coating on the wire is substantially equal to the difference between the cross-sectional areas of the uncoated wire and of the peripheral groove 18. As best shown in Fig. 2, the groove is triangular in cross section and deep enough so that the wire does not project above the face 17 of the wheel 14. As the wire emerges from the lacquer, and from the peripheral groove 18, the viscous lacquer flows sufficiently, before it gels, to form a uniform cylindrical coating about the underlying wire.

It is important that the wiper element 22 be large enough so that the viscous lacquer cannot flow around it and so add to the thickness of the coating after the wire has emerged from the body

of lacquer. This is most conveniently accomplished by making the wiper element 22 in the form of a wheel having substantially the same radius of curvature and the same width of face as the rotatable wheel. However, the wiper element need not be a wheel of exactly the same size as the rotatable wheel. It may be in the form of a non-rotatable wheel having a diameter that ranges from about one-half up to three or four times the diameter of the rotatable wheel, and its face width may be any amount greater than that of the rotatable wheel. The face width of the rotatable wheel, and consequently the face width of the wiper element (measured in a direction parallel to the axis of the wheel), should be at least three times as great as the maximum width of the groove 18, and preferably five times or more the maximum width of such groove, in order to insure against flow of the viscous lacquer over the face of the wiper element and wheel, as the wheel rotates, onto the emerging coated wire 30. The face of the wiper, instead of being exactly cylindrical, may be only approximately so.

It is not essential that the wiper element 22 be in the form of a wheel. It may instead be in the form of a segment of a wheel, provided only that it is of sufficient angular width to prevent any of the lacquer from flowing over it and onto the coated wire. An angular width of 30° to 45° is ordinarily sufficient for this purpose. It is important, however, that the wiper element be non-rotatable about the center of curvature of its face. It has been found that if the wiper is in the form of a rotatable wheel, the coating formed on the wire is of irregular thickness; and sometimes is actually stripped from the wire immediately upon emergence of the wire from the body of lacquer.

It is not essential that the peripheral groove 18 in the rotatable wheel have the triangular cross section shown in the drawings. It may equally well be square, oval or of any other desired cross-sectional shape. However, a triangular groove is very easily formed to accurately control dimensions, and it is fully as satisfactory as other groove shapes.

The copending application of Harry L. Saums et al., Serial No. 749,804, filed May 22, 1947, now Patent No. 2,547,047, issued April 3, 1951, describes and shows an applicator more or less similar to that described and claimed herein, but having two rotatable grooved wheels. The applicator of the present invention has been found to be more satisfactory than that of the Saums et al. application because it has been found difficult to keep the two grooved wheels of the latter in the accurate alignment that is necessary to produce a uniform coating on wires of fine size. No such problem is involved with the applicator of the present invention.

We claim:

1. Apparatus for applying a viscous liquid coating composition to a wire comprising a vessel for containing the composition, a rotatable wheel having a cylindrical face partially immersed in the composition, the cylindrical face of said wheel being formed with a peripheral groove for receiving a wire and guiding it down into and up again out of the liquid coating composition, said wheel being freely rotatable whereby its speed of rotation is determined solely by the speed with which the wire is drawn through the coating composition, and a wiper element having a cylindrically curved face of approximately the same radius of curvature as the rotatable wheel bearing against the cylindrical face of said wheel about at the point where the wire emerges from the coating composition, the wiper element being restrained from rotation about the center of curvature of its face, and the center of the wheel and the center of curvature of the face of the wiper element being substantially horizontally aligned.

2. Apparatus for applying a viscous liquid coating composition to a wire comprising a vessel for containing the composition, a rotatable wheel having a cylindrical face partially immersed in the composition, the cylindrical face of said wheel being formed with a peripheral groove for receiving a wire and guiding it down into and substantially vertically up again out of the liquid coating composition, said wheel being freely rotatable whereby its speed of rotation is determined solely by the speed with which the wire is drawn through the coating composition, and a wiper element in the form of a non-rotatable wheel having a cylindrical face of approximately the same radius of curvature as the rotatable wheel, the cylindrical face of the non-rotatable wheel bearing against the cylindrical face of the rotatable wheel about at the point where the wire emerges from the coating composition.

3. Apparatus for applying a viscous liquid coating composition to a wire comprising a wheel-supporting frame, a wheel having a peripherally grooved cylindrical face mounted for free rotation on said frame, a wiper-supporting arm pivotally secured to said frame, a wiper element having a cylindrically curved face of approximately the same radius of curvature as the wheel mounted on said arm and restrained from rotation about the center of curvature of its face, the center of the wheel and the center of curvature of the face of the wiper element being substantially horizontally aligned and spring means urging the wiper-supporting arm on its pivotal mounting toward the rotatable wheel, whereby to bring the cylindrical face of the wiper element into engagement with the cylindrical face of the rotatable wheel.

HOWARD W. STURGIS.
EMIL H. OLSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,387,606	Meyer	Aug. 16, 1921
1,969,667	Kress	Aug. 7, 1934
2,156,607	Schon	May 2, 1939
2,197,622	Sendzimir	Apr. 16, 1940
2,289,862	Bailey	July 14, 1942
2,323,487	Rayburn	July 6, 1943
2,350,742	Fordyce	June 6, 1944