Feb. 6, 1934. O. F. FREELAND 1,945,851

WIRE COATING MACHINE

Filed Nov. 8, 1930 2 Sheets-Sheet 1

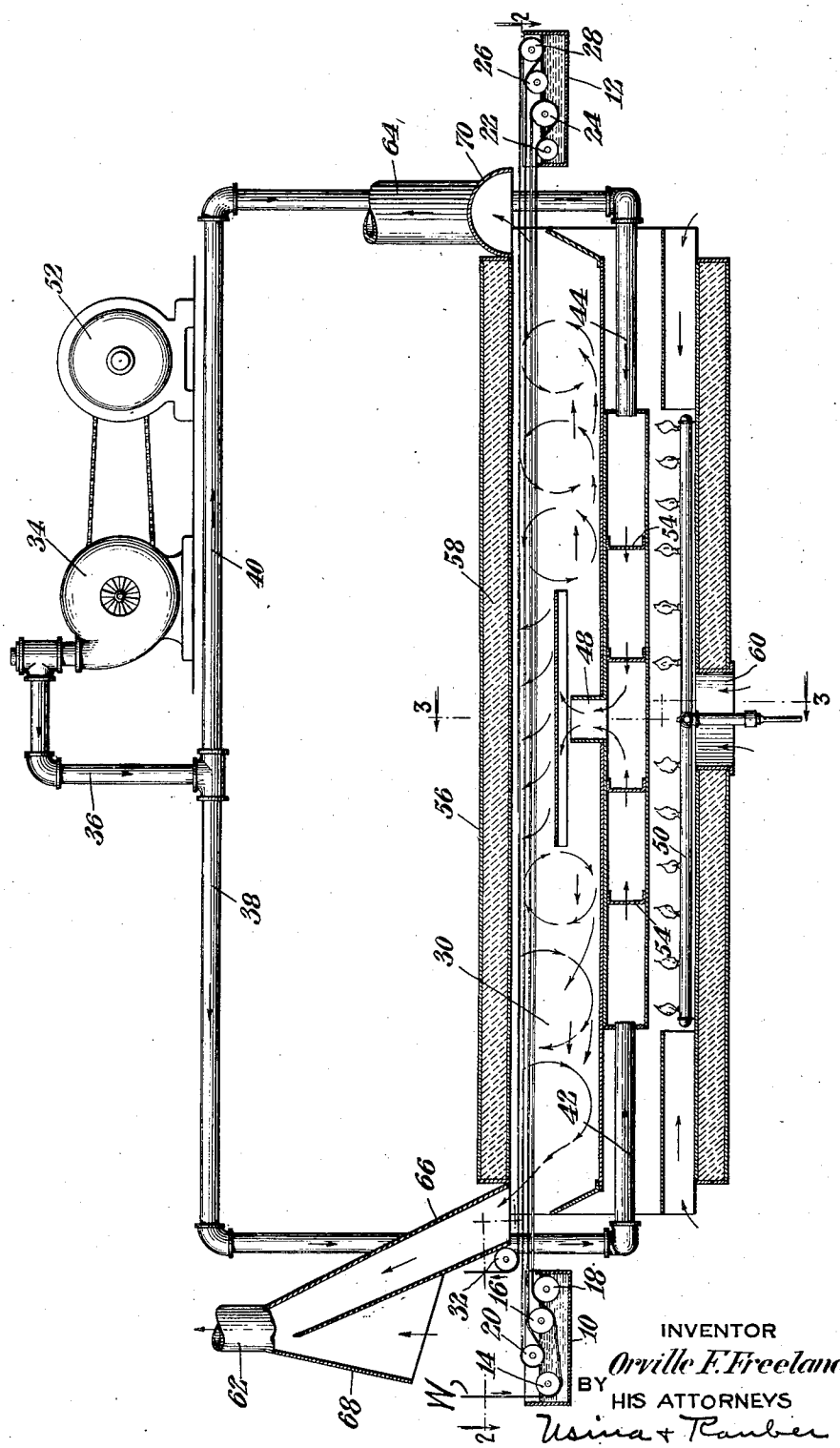


Fig. 1.

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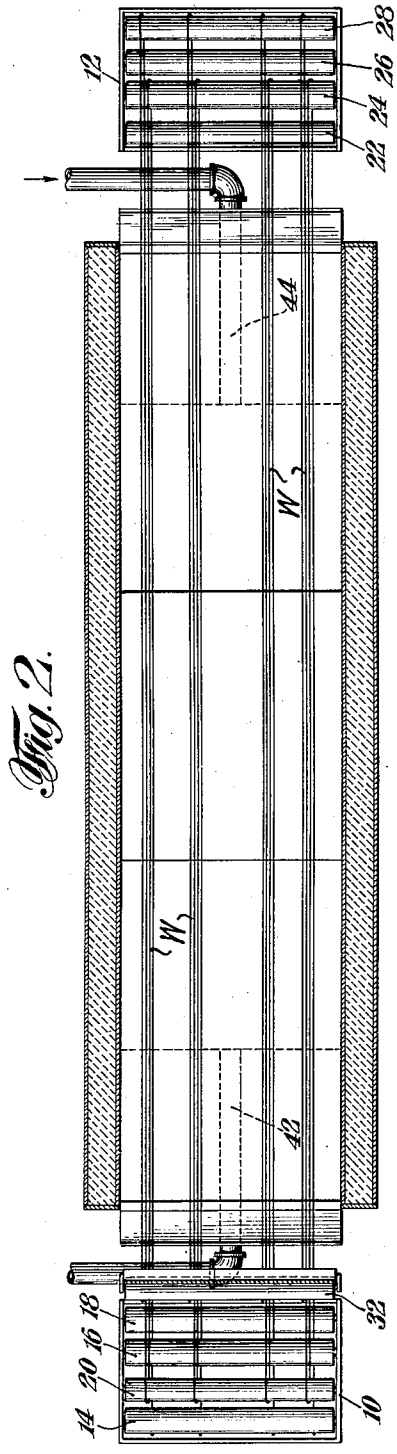


Fig. 2.

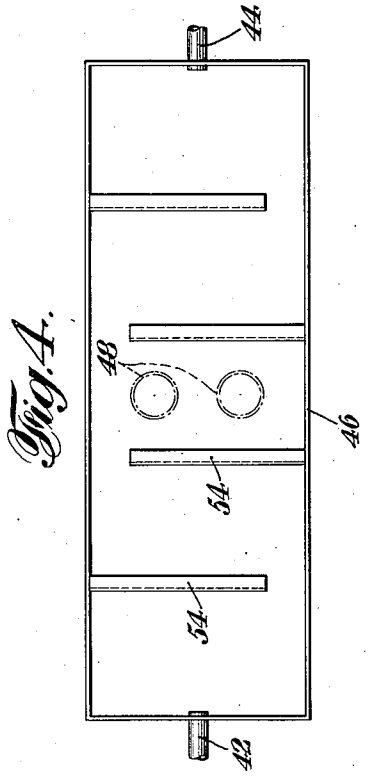


Fig. 4.

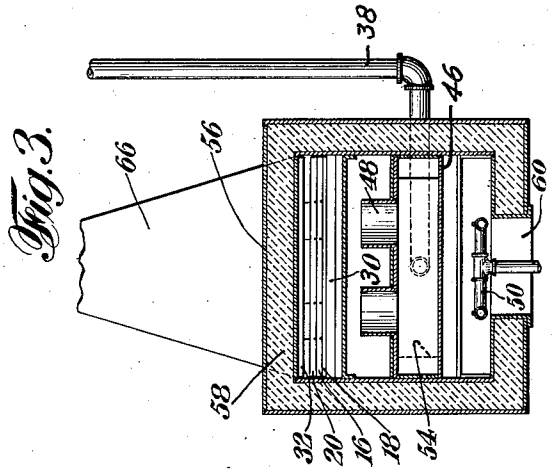


Fig. 3.

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UNITED STATES PATENT OFFICE

1,945,851

WIRE COATING MACHINE

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Application November 8, 1930. Serial No. 494,268

6 Claims. (Cl. 91—55)

This invention relates to machines adapted for coating electric conductor wire with insulating material such as insulating varnish or enamel. It has heretofore been the practice to coat or enamel wire by passing it through a suitable bath, the wire being dried by exposure to heat radiated from a suitable heating element such as an electric, oil heater or gas burner. Heretofore drying or baking of insulated coatings has been ununiform due to changes in temperature conditions in the room or by changes in outside atmospheric conditions. Where the coating material such as enamel or varnish is dried or baked by subjecting the coated wire to radiant heat there is a tendency to bake the enamel harder on the side next to the source of heat.

The present invention aims to provide means whereby there will be no unevenness in the thickness of the coating as heretofore caused by variations in atmospheric conditions and also to provide means whereby the wire treated will have a coating of uniform thickness throughout its length.

In the embodiment of the invention described, the enamel or similar coating material is dried or hardened by convection currents of air which are caused to surround the entire surface of coated wire and thus equalize the temperature throughout the entire surface. I also provide means for preheating the air which dries the coating. This preheated air is preferably forced under pressure through an elongated oven or heating chamber. In this way, I carry on the drying or baking operation under a slight positive pressure so that there can be no infiltration of atmospheric air from the room in which the apparatus is located. Thus I avoid variations in the hardness due to changes in room temperature or changes in outside atmospheric conditions.

It is of utmost importance in the manufacture of enameled wire to supply wire in which the coating material is of uniform thickness, texture, hardness and appearance throughout. By such uniformity of coating, the insulating value will be the same for all parts of the wire, hence no one part will be more apt to fail in practice than any other part. It is important to have uniformity of hardness and color. Hardness determines the resistance of the coating to abrasion by different convolutions coming in contact with one another, for example, when the wire is wound to form magnets or the like. Uniformity of color is important because the sale value depends somewhat upon this uniformity of appearance. The requirements referred to present problems which my invention solves.

The invention will be fully apparent from the following specification when read in connection with the accompanying drawings and will be defined with particularity in the appended claims. In the drawings, Fig. 1 is a longitudinal vertical section through an apparatus embodying the invention;

Fig. 2 is a horizontal section on line 2—2 of Fig. 1;

Fig. 3 is a transverse vertical section on line 3—3 of Fig. 1;

Fig. 4 is a detail plan view of a heating chamber shown in Fig. 1.

Referring in detail to the drawings, 10 and 12 are tanks located at opposite ends of the apparatus, each tank being adapted to contain a body of liquid insulating material such as insulating varnish, enamel or the like. The tank 10 has rotatably mounted therein a plurality of rollers 14, 16, 18 and 20. The tank 12 has similar rollers 22, 24, 26 and 28 mounted therein. The wire to be coated indicated at W passes under rollers 14 and 16 and over roller 18; thence through an oven chamber 30 over roller 22 in a tank 12 under roller 24; then through the oven chamber over roller 16 in tank 10 and around roller 20, then through the oven chamber 30 again; then over roller 26 in tank 12 and around roller 28; then again through the oven chamber 30. The end of the wire leaving the oven chamber passes around a guide roller 32. The several rollers 14, 16, 18, 20, 22, 24, 26 and 28 all dip into the enamel bath. Thus, each time the wire passes through the oven, it receives and has baked thereon a coat of insulating material.

In the embodiment of the invention illustrated, in passage through the oven 30, the wire has four coats baked thereon. During its passage through the oven chamber 30, the wire is subjected to the heat of convection currents of air. This air is forced by a blower 34 through pipes 36, 38 and 40 to inlet pipes 42 and 44 which communicate with the opposite ends of a heating chamber 46. At the center, this chamber communicates by means of ducts 48 with the central zone of the oven 30. The air forced to the heating chamber by the blower 34 is heated by any suitable means such as a gas burner 50. Or, if desired, an electric heating element or hot water pipe may be used. The blower 30 is power driven preferably by an electric motor as indicated at 52. The heating chamber 46 contains a number of baffles 54 which compel the incoming air to

flow in a circuitous path from the inlet pipes 42 and 44 to the outlet ducts 48 which communicate with the oven 30.

The oven, heating chamber, and burner are preferably enclosed in a casing 56 which is provided with a layer of heat insulating material indicated at 58.

The supply pipe for the gas burner 50 enters through an opening 60 in the casing which also serves to admit air to support combustion in the fuel supplied to the gas burner.

The products of combustion from the burner 50, the heated air from the oven 30 and fumes arising from the tanks 10 and 12 are adapted to be passed out to atmosphere through vent pipes 62 and 64. The vent pipe 62 is provided with one hood portion 66 which receives the outgoing air from the oven chamber 30. Another hood portion 68 overlies the tank 10. The air which is forced out under pressure through the hood portion 66 creates sort of a draft or suction which tends to exhaust the fumes arising from the bath in the tank 10. These fumes pass out through the hood portion 68. The draft created will also carry off the products of combustion from the burner 50. These outgoing hot products serve also to keep the bath in the tank at the proper temperature. The vent pipe 64 may be provided with substantially the same hood arrangement as shown on the pipe 62 or in some cases it may have a single substantially semicircular hood as shown at 70.

In operation, usually a great number of bare wires are fed through the oven at the same time. Sometimes as many as 50 wires are passed through the apparatus alongside of one another. The description refers merely to one wire, but it will be understood that a number of wires treated at a given time is dependent only upon the proper proportioning of the apparatus. While we have shown apparatus for applying four separate coats to a single wire, the apparatus being adapted for drying each coat, it will be understood that the number of coats may be varied at will depending upon the particular use to which the wire is to be put in service. With the apparatus described, it will be clear that the power driven blower supplies preheated air under pressure to the oven chamber. Thus there is always a positive pressure maintained therein. This pressure prevents the infiltration of atmospheric air which would tend to vary the temperature within the oven and thus cause uneven drying. The convection currents of air apply a uniform heat to all sides of the wire and thus avoid a formation of hard zones such as produced by the old apparatus wherein the product is heated by radiation.

While I have described quite specifically the particular embodiment of the invention herein illustrated it is not to be construed that I am limited thereto since various modifications and substitution of equivalents may be made by those skilled in the art without departing from the invention as defined in the appended claims.

What I claim is:—

1. In a wire enameling machine, a drying oven comprising a substantially horizontal oven open at both ends, air exhaust ducts positioned adjacent each open end, means to force preheated air substantially free from products of combustion into the central portion of said oven and baffle means to distribute the said air through the oven and to the said air exhaust ducts.

2. In a wire enameling machine, a drying oven comprising a substantially horizontal oven chamber open at both ends, air exhaust ducts positioned adjacent each open end, a heat exchange device having a heated chamber and an adjacent but separate heat exchange chamber, an air inlet and an air outlet in said heat exchange chamber, the said air outlet opening into the central portion of the said oven, means to generate heat in said heated chamber and means to force air into and through said heat exchange chamber into the said oven.

3. In a wire enameling machine, a drying oven comprising a substantially horizontal oven chamber open at both ends, air exhaust ducts positioned adjacent each open end, a heat exchange device having a heated chamber and an adjacent but separate heat exchange chamber, an air inlet and an air outlet in said heat exchange chamber, the said air outlet opening into the central portion of the said oven, means to generate heat in said heated chamber and means to force air into and through said heat exchange chamber into the said oven and baffle means to distribute said air through the oven to the said air exhaust ducts.

4. A wire enameling machine comprising a substantially horizontal drying oven open at both ends, air exhaust ducts positioned adjacent each end, enameling tanks located adjacent each open end, means to pass wire into said tanks and through the oven, means to force preheated air substantially free from products of combustion into the central portion of said oven and baffle means to distribute the said air to the said air exhaust ducts.

5. A wire enameling machine comprising a substantial horizontal drying oven open at both ends, enameling tanks positioned adjacent said ends, means to pass wire into said tanks and through the oven, air exhaust ducts adjacent each open end, an air inlet duct positioned in the central portion of the said oven, baffle means to distribute air entering through said inlet to each end of the said oven, means to force substantially pure air through said inlet, and means to preheat said air, said means including a heat exchange device adapted to preheat said air without admixing therewith gaseous products of combustion.

6. The method of drying enamel, varnishes and the like insulating materials on coated wires which comprises passing thereover a strong free flow of preheated air substantially free from gaseous products of combustion.

ORVILLE F. FREELAND.