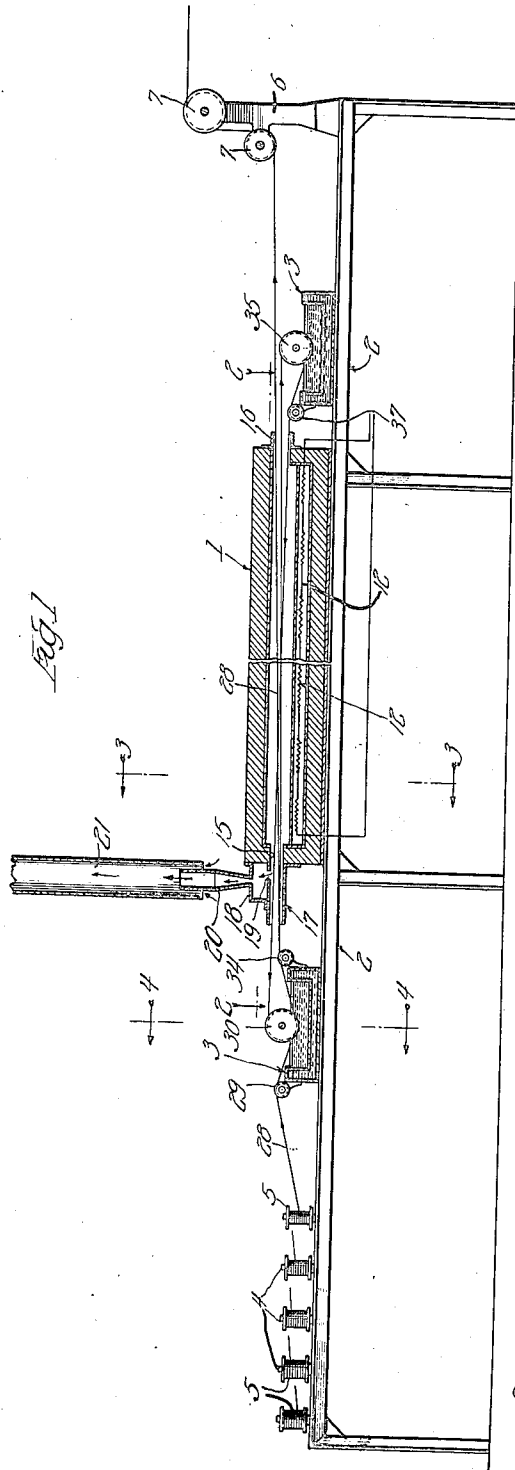


Feb. 6, 1923.

A. MARING.
WIRE ENAMELING MACHINE.
FILED APR. 19, 1920.

1,444,079

3 SHEETS-SHEET 1



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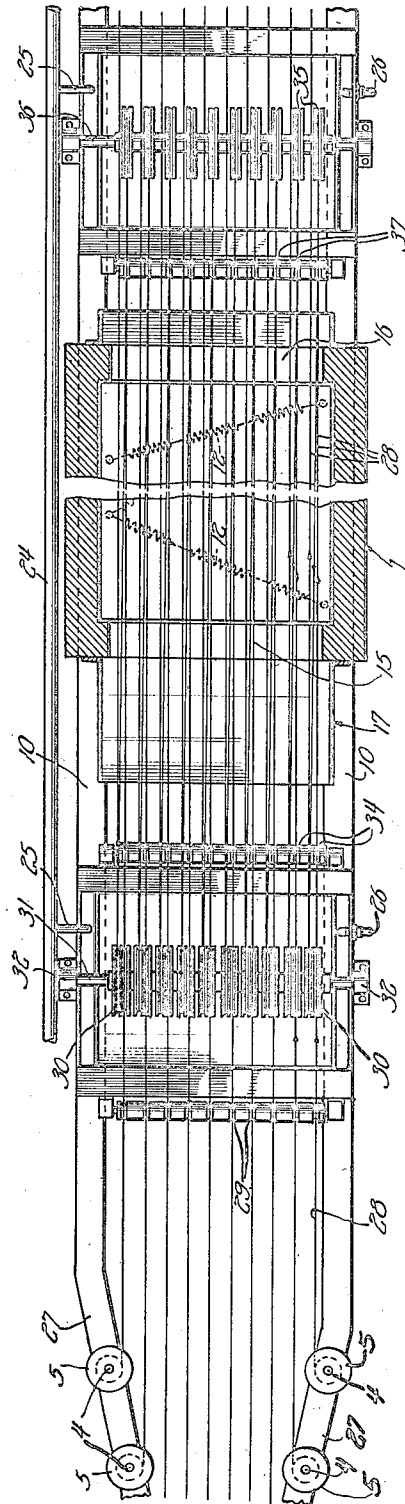
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3 SHEETS-SHEET 2

Fig. 2



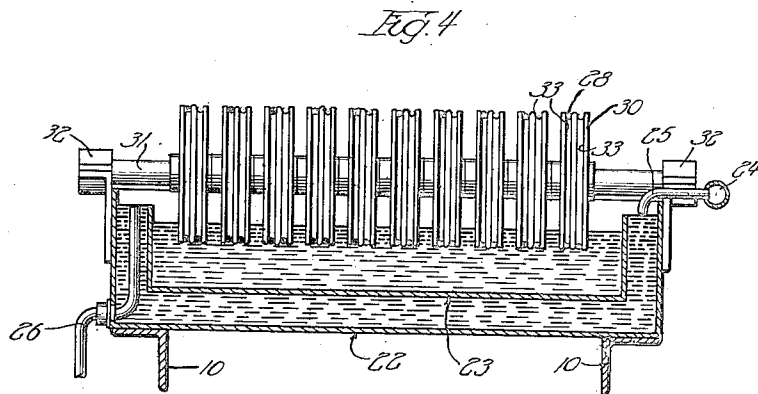
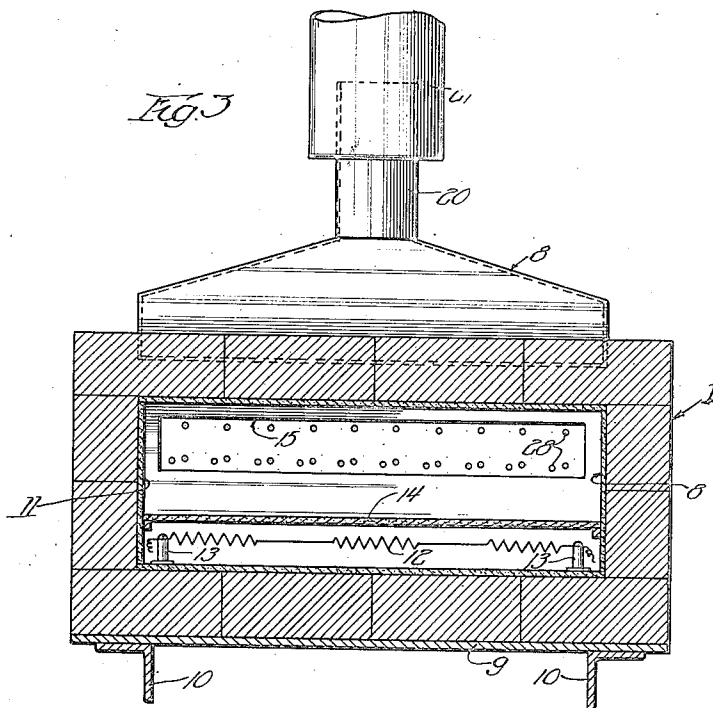
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3 SHEETS-SHEET 3



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UNITED STATES PATENT OFFICE.

ALBERT MARING, OF MUSKEGON, MICHIGAN, ASSIGNOR TO MARING WIRE COMPANY,
OF MUSKEGON, MICHIGAN, A CORPORATION OF MICHIGAN.

WIRE-ENAMELING MACHINE.

Application filed April 19, 1920. Serial No. 374,310.

To all whom it may concern:

Be it known that I, ALBERT MARING, a citizen of the United States, and a resident of Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Wire-Enameling Machines, of which the following is a specification.

This invention relates to improvements in wire enameling machines, and more particularly to machines of the character described employed for treating copper wire with a coating of insulating material ordinarily known as insulating varnish or enamel, such wire being used extensively as electrical conductors in coils and other electrical elements.

The purpose of this invention is to provide an improved construction for the machine for applying the coating of insulating substance to the wire and subjecting the coated wire to a baking process whereby the coating is hardened in the passage of the wire through the machine. A further object of the invention is to provide a method of treating the wire in such a manner that a number of coatings of enamel may be applied successively, each coat being baked or hardened prior to the application of a successive coating of the enamel, thereby insuring a more perfect and uniform distribution of the insulating material over the surface of the wire, and, in short, insuring a more superior product for the many uses for which it may be used.

The machine embodying the feature of my invention is hereinafter fully described and illustrated in its preferred form in the accompanying drawings, in which

Fig. 1 is a view in side elevation of the complete machine, showing the oven and the enamel tanks in longitudinal section,

Fig. 2 is an enlarged plan view of the machine showing the disposition of the strands of wire therethrough, and showing the oven in section as taken on line 2—2 of Figure 3,

Fig. 3 is an enlarged view in section taken on line 3—3 of Figure 1, and

Fig. 4 is an enlarged detailed view of one of the enamel tanks in section, as taken on line 4—4 of Figure 1.

Referring in a more general way to the machine embodying the feature of my invention, the same comprises a horizontal oven 1 supported at a suitable height from

the floor level upon a frame 2 extending beyond the ends of the oven, and supporting other parts of the machine consisting of two enamel tanks or baths 3—3 located at either end of the oven 1, and beyond one of the enamel tanks there being mounted a plurality of vertical spindles 4 on which are mounted spools of wire 5, from which the wire is fed to the machine. At the opposite end of the supporting frame 2 is a standard 6 carrying guide rollers 7—7 serving to direct the finished wire to a suitable winding machine whereby the same is rewound on spools such as illustrated as 5.

Referring to the oven 1, the same consists of a horizontal elongated member of any desired width and of comparatively small height as compared to its length, said oven being of any suitable construction, though preferably consisting of upper, lower and side walls erected of bricks composed of fire clay, or other refractory substance, these walls forming an elongated chamber 8 extending throughout the length of the oven and comparatively shallow. The oven is preferably supported on a base plate 9 which in turn rests upon longitudinal angle members 10—10 of the frame 2. The interior of the chamber 8 may be lined with a layer 11 of heat insulating material, if desired. At the bottom of the chamber 8 is provided a heating coil or element 12 of any suitable construction and arrangement, and herein shown as a series of conductors extending from one end to the other of the chamber in zigzag fashion, these conductors having sufficient resistance to generate heat when a current of electricity is passed through the same. The conductors are preferably supported on upright terminals 13—13 located at various points throughout the chamber. Immediately above the heating coil 12 is a layer of insulating material such as asbestos 14, serving to separate the heating element from the remaining space within the chamber. At either end of the oven are provided transverse openings 15 and 16. The former is located at the left hand end of the oven as shown in Figure 1, serving as the entrance opening, and the opening 16 at the opposite end serving as the exit or discharge opening. Extending horizontally from the entrance opening 15 is a protruding mouth 17 which communicates with a hood 18 immediately above it through

a suitable opening 19. The hood is provided with an upwardly opening discharge pipe or flue 20 terminating within the lower end of a somewhat larger pipe 21. The hood 18 communicating with the interior of the oven by means of the opening 15 provides for the removal of the fumes generated during the baking process, these fumes being drawn outwardly through the forward end of the oven and upwardly into the flue 21 by a current of air passing into the oven through the opening 16 at the opposite end, this current or flow of air being promoted by the influx of free air at the lower end of the vertical pipe 21, this having the effect of an injector in that it draws the fumes upwardly from the mouth of the smaller pipe 20.

As before suggested there is mounted upon the frame 2 and immediately adjacent to the ends of the oven, the enamel tanks or baths 3, these tanks being of any suitable construction, although preferably consisting of an outer tank 22 extending transversely between the longitudinal frame members 10—10, and an inner tank 23 somewhat smaller in dimension and capacity, these tanks being supplied with a liquid insulating substance from a common source preferably including a pump, which forces the liquid through a pipe 24 and a nozzle 25 into the outer tank and thence into the inner tank 23. An overflow pipe 26 communicating with the central source of supply returns the overflow thereto and thus insures a constant circulation of the insulating liquid through the tanks.

Referring now to the manner in which the wire is fed through the machine, the several spindles 4 are mounted at one end of the frame in horizontal alignment with the entrance end of the oven and beyond the enamel tank adjacent thereto these spindles with their spools 5 mounted thereon being mounted in spaced relation along diverging members 27—27, which form the spool rack of the machine, this arrangement being desirable in order that the wire from each spool may be fed to the machine in a series of parallel strands of any desired number and spaced apart at convenient distances. These several parallel strands of wire which are fed from the individual spools follow the same course through the machine, and therefore in order that a clear understanding may be had a single wire will only be considered in describing the operations upon the wire and its course through the machine upon leaving its spool 5. The wire 28 under consideration extends from its spool 5 to the tank 3 adjacent to the entrance end of the oven, passing over a guide roller 29 journaled in suitable brackets on the outer side of the tank, said guide roller having a plurality of spaced grooves each adapted to

carry one of the wires. From the guide roller 29 the wire passes downwardly into the tank and engages the under side of a sheave 30, which is one of a plurality of similar sheaves journaled on a shaft 31 extending longitudinally of the tank and transversely of the path of the wire, the ends of said shaft being mounted in suitable brackets 32 secured to the tank. These sheaves are of sufficient diameter to extend into and to be partially immersed in the insulating liquid within the tank, and further, of sufficient width to provide for the formation of two annular grooves 33 on their faces. The wire engages one of the grooves hereinafter to be more specifically defined, and upon leaving its respective sheave passes over a guide roller 34 identical in all respects to the guide roller 29 on the opposite side of the tank, said guide roller 34 being located at substantially the same height as the entrance of the oven 15. The wire upon leaving the guide roller 34 passes through the oven and outwardly therefrom through the discharge opening 16 at the opposite end, passing over a sheave 35, which as before is one of a plurality of similar sheaves, mounted on a shaft 36 in identically the same manner as described in connection with the sheaves 30. As a preferable construction, the sheaves 35 are provided with a single groove on their faces. In that respect only do they differ from the sheaves 30. Passing around its respective sheave 35, the wire 28 is carried into contact with the liquid by being immersed therein, and from thence passes upwardly and forwardly in opposite direction over a guide roller 37 mounted at the inner edge of the tank and serving the same function as the guide rollers 29 and 34 hereinbefore described, it being understood that these guide rollers act to properly define the course of the wire in order that it may be free from contact with parts of the machine in its passage there-through. From the guide roller 37 the wire is again directed into the oven through the opening 16, passing through the same and outwardly therefrom through the entrance opening 15 directly to the same sheave 30 which it passed over immediately before entering the machine, but in this instance it engages the other of the two grooves. As before, the wire passes around the sheave, then toward the oven, passing over the guide roller 34 and thence through the oven outwardly through the discharge opening 16 and directly to the guide rollers 7—7 and thence to the winding machine.

Following with more exactness the passage of a single wire through the machine, it is to be observed that each wire passes throughout the entire length of the oven three times, being carried backwardly and forwardly by means of the rotating sheaves

30 and 35, it being further observed that the direction of movement of the wire, as well as the direction of rotation of the sheaves, is such that the wire upon leaving the tank enters the oven directly with the exception of its contact with the guide rollers 34 and 37 immediately adjacent to the openings. The result is that the wire having received a coating of the insulating substance passes immediately into the oven where a baking process is carried on, thus providing a hardened coating, covering the wire. Immediately after the first coating is applied, it is immersed in the liquid again and passed through the oven a second time, thus applying and baking a coating surrounding the initial coat. Again the wire is immersed in the insulating material and passed through the oven. Thus a third coat is applied and hardened. Clearly this process may be continued to almost any degree desired by the multiplication of the sheaves so that a larger number of coats may be applied if so desired.

Although I have described a preferred construction for a machine embodying the features of my invention, it is manifest that it may be variously modified as to its details of construction without departing from the spirit of the invention. Therefore, I do not wish to be limited except in so far as my invention is specifically set forth in the appended claims.

I claim as my invention:

1. A wire enameling machine comprising a horizontal oven open at its ends, means for feeding a strand of freshly coated wire thru said oven in one direction, a heating element adjacent the wire entrance end of said oven, an air exhaust duct communicating with said oven adjacent said entrance end, and means for creating a draft in said duct to draw the air thru the oven from the wire outlet end thereof.

2. A wire enameling machine comprising a horizontal elongated oven having openings at either end, means for coating and feeding a strand of wire thru said oven, heating elements distributed from the wire entrance end of said oven toward the opposite end thereof, and means for drawing off the fume laden air from said oven, comprising a hood surrounding the entrance opening of said oven, a duct connected with said hood, and means for promoting suction in said duct to insure the rapid removal of the fumes.

3. In a wire enameling machine, comprising a horizontal oven provided with an electrical heating element, means for coating and guiding a strand of wire into said oven at one end, there being provided an air intake opening at the opposite end of said oven and a fume removing duct communicating with said oven adjacent the wire entrance end thereof, and means associated with said

duct for promoting the flow of air thru said oven.

4. A wire enameling machine comprising a horizontal oven open at both ends and having electrical heating elements distributed thruout the length thereof, guide pulleys mounted adjacent each end, and an enamel bath adjacent one end, a fume exhausting hood surrounding the wire entrance end and communicating with the interior of said oven, a duct leading from said hood, and means for promoting suction in said duct.

5. A wire enameling bath comprising a horizontal oven open at its ends, an enamel bath mounted at each end of said oven, and means for feeding wire through said baths in separate strands, traveling in opposite directions, immersing each strand in said baths and guiding the same in to the open ends of said oven.

6. A wire enameling machine comprising a horizontal oven open at its ends, an enamel bath located adjacent each end of the oven, and sheaves mounted at the ends of said oven and adapted to carry a wire through said baths and oven in strands, traveling in opposite directions.

7. A wire enameling machine comprising a horizontal oven open at its ends, a bath located at each end of said oven, sheaves journaled adjacent and in substantially horizontal alignment with the end openings of said oven and depending into said baths, and means for guiding a wire carried on said sheaves from each bath into the ends of said oven.

8. A wire enameling machine comprising a horizontal oven open at its ends, a sheave mounted adjacent each end of said oven, a bath associated with each sheave, into which the same are partially immersed, said sheaves being mounted substantially in alignment with the open ends of said oven, whereby a wire is fed through the oven in opposite directions, with all strands traveling in substantially the same horizontal plane.

9. A wire enameling machine comprising a horizontal open ended oven, an enamel bath mounted at each end of said oven, sheaves mounted at the ends of said oven and substantially in horizontal alignment with the open ends thereof, said sheaves depending into said baths, and means for guiding a wire carried by said sheaves through said oven in strands traveling in opposite directions from said bath into the adjacent end of said oven.

10. A wire enameling machine comprising a horizontal oven open at its ends, sheaves mounted at opposite ends of said oven and arranged to guide a strand of the wire through the oven in one direction, reversing the direction, and guiding another strand

through the oven in opposite direction, said strands lying substantially in the same horizontal plane, and means for applying enamel to each strand prior to entering the ends of the oven.

11. A wire enameling machine comprising a horizontal oven open at its ends, an enamel bath at each end of said oven, series of sheaves arranged transversely of each opening, and adapted for partial immersion in the adjacent baths, guide pulleys intermediate said sheaves, and ends of the oven, whereby a plurality of wires are fed in opposite directions through the oven from a sheave at one end to a corresponding sheave at the opposite end, the several strands of each wire traveling in substantially the same horizontal and vertical planes.

12. In a wire enameling machine, the combination of an oven open at its ends, a spool rack arranged to feed a wire into one end of said oven, a series of sheaves at opposite ends of said oven and arranged to guide a wire alternately through the oven in a plurality of strands traveling in opposite directions, guide pulleys acting to direct the several strands along substantially the same path through the oven and an enamel bath through which each strand is immersed before entering the oven.

13. In a wire enameling machine, the combination of a horizontal oven provided with openings at the ends thereof, a heating element within said oven, and means for guiding a wire thru said oven alternately in opposite directions, comprising sheaves

mounted adjacent the ends of the oven, an enamel tank mounted beneath each of said sheaves, said sheaves being partially immersed therein, and guide pulleys adjacent each tank for guiding the advancing strands into the openings of the oven.

14. In a wire enameling machine, the combination of a horizontal oven provided with openings at the ends thereof, a heating element within said oven, means for continuously feeding wire to said oven, from a spool, comprising sheaves mounted at each end of said oven, and adapted to guide the strands of wire back and forth thru said oven, an enamel applying bath located beneath each sheave, the same being adapted to be partially immersed in the liquid of said baths, and guide pulleys mounted in alignment with the openings to said oven, and adapted to guide the strands from said baths into the oven.

15. In a wire enameling machine, the combination of an oven open at its ends, a spool rack arranged to feed a wire into one end of said oven, a series of sheaves at opposite ends of said oven and arranged to guide the wire alternately thru the oven in opposite directions, guide pulleys acting to direct the several strands along substantially the same path thru the oven and an enamel bath thru which each strand is immersed before entering the oven.

In witness whereof, I hereunto subscribe my name this 31st day of March, A. D., 1920.

ALBERT MARING.