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APPARATUS FOR COATING MAGNET WIRE AND THE LIKE

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This invention relates to apparatus for coating wire, as in the production of magnet wire, and has particular reference to an improved wire coating apparatus of the type including an oven through which the wire is moved lengthwise in multiple passes back and forth from one end of the oven to the other, and applicator means located at one or both ends of the oven for coating the wire with a coating liquid or with two different coating liquids.

In cases where magnet wire is to be provided with multiple coatings of two different film-forming liquids, such apparatus as used heretofore has included two applicators, one at each end of the oven, for applying the respective liquids to the wire. For example, the applicator at the front end of the oven applies two or more coatings of a dielectric undercoating liquid while the applicator at the rear end applies two or more coatings of a finish coating liquid, each coating from each applicator being dried or cured by movement of the corresponding wire pass through the oven before application of the next coating. This requires that the wire bypass the rear applicator while picking up the necessary number of dielectric coatings for the proper dielectric "build" on the wire, and that the wire then bypass the front applicator while picking up the proper number of finish coatings on its way to the usual windup reel or spool. Thus, the passes of the wire through the oven in returning to an applicator, for another coating of the corresponding liquid over a similar coating previously applied by such applicator, are useless or "dry" passes, as each coating from such applicator is dried or cured when it first passes through the oven. These useless return passes substantially reduce the oven capacity in the application of two different coating materials to the wire, as compared with its capacity when the same total number of coats of a single material are applied from applicators at both ends of the oven.

The principal object of the present invention is to provide a wire coating apparatus of the character described which overcomes the above-noted disadvantage of useless return passes and reduced oven capacity when applying different coating materials to the same wire. A further object is to provide such an apparatus which is adjustable to vary the number of coatings of each of the two different coating materials to be applied to the wire, and which is adapted for coating the wire with two or more different materials and with all liquid coatings receiving identical exposure in the oven.

A wire coating apparatus made according to the invention comprises a pair of coating applicators located adjacent the oven at one end thereof and each including a block having a channel disposed below a series of wire passes moving to the oven, and means for supplying two different coating liquids to the respective applicator channels, each applicator including at least one die for applying the corresponding coating liquid to a selected pass of the series which is not coated by a die of the other applicator and also including spacer means forming a space for movement of each pass of the series which is coated by a die of the other applicator. In this way, each pass of the series receives a coating from one of the two applicators and by-passes the other applicator. With the use of only one pair of such applicators as described, each coating applied to the wire from an applicator will move through the oven twice (once to the far end of the oven and again back to the applicators for the next coating) before application of the next coating, which may be desirable in cases where the coatings cannot be sufficiently dried or cured in a single pass through the oven. However, even in such cases the use of the dual applicators at one end of the oven will cause all of the liquid coatings to receive identical exposure in the oven, contrary to the situation in which the two applicators are located at opposite ends of the oven.

The apparatus in its preferred form comprises a pair of coating applicators located at each end of the oven, the applicators of each pair being positioned to apply coating liquid to an overlying series of the wire passes moving to the oven, pipes leading to one applicator of each pair for supplying thereto a first coating liquid, and pipes leading to the other applicator of each pair for supplying thereto a second coating liquid. Each applicator of each pair includes at least one die for applying a coating of the corresponding liquid to a wire pass of the corresponding series and forms a bypass space for passage of each wire pass coated by a die of the other applicator of this pair. Accordingly, each coating applied to the wire will pass through the oven only once before application of the next coating, whether this next coating be of the same material as the previous coating or of a different material, and each pass moving in either direction through the oven will have received a liquid coating from an applicator of one pair either before or after bypassing the other applicator of such pair.

In its preferred construction, each applicator includes a driven shaft extending along the corresponding liquid supply channel above the bottom thereof, and a trough mounted in the channel and provided with a series of holes spaced along the channel. Each die of the applicator is in the form of a circular disc provided with a circumferential groove for supplying the film-forming liquid coating to the wire, the bottom of this groove being formed with a smaller circumferential groove through which the wire moves and which is triangular in cross-section and dimensioned to determine the thickness of the film deposited on the wire. Each disc or die is mounted on and rotated by the shaft with the lower portion of the disc fitting closely in the trough and with the die groove overlying one of the holes in the trough through which liquid is supplied to this groove from the channel. Rotation of the die applies a continuous and complete coating of the liquid to a corresponding pass of the wire moving over the die through its groove. The shaft is preferably provided also with spacer means located on those portions of the shaft not occupied by the die or dies and which permit bypassing of the applicator by the pass or passes of the corresponding series receiving a coating from the companion applicator of the corresponding pair.

Plug means are preferably provided in each applicator trough to substantially fill those portions of the trough not occupied by the die or dies, thereby blocking or limiting flow of the corresponding liquid upwardly through those holes of the trough which are not aligned with the groove of a die. This reduces the flow required in the liquid supply channel below the trough, thereby limiting overflow of the liquid. Preferably, keys are provided to secure the plug means against rotation with the shaft, and the keys adjacent exposed end faces of the dies also effect a wiping action to prevent the film-forming liquid from accumulating on these faces.

These and other features of the invention will be better understood by reference to the accompanying drawings illustrating a preferred form of the apparatus. In the drawings:

FIG. 1 is a diagrammatic plan view of the apparatus, illustrating certain principles involved;