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WIRE COATING APPARATUS

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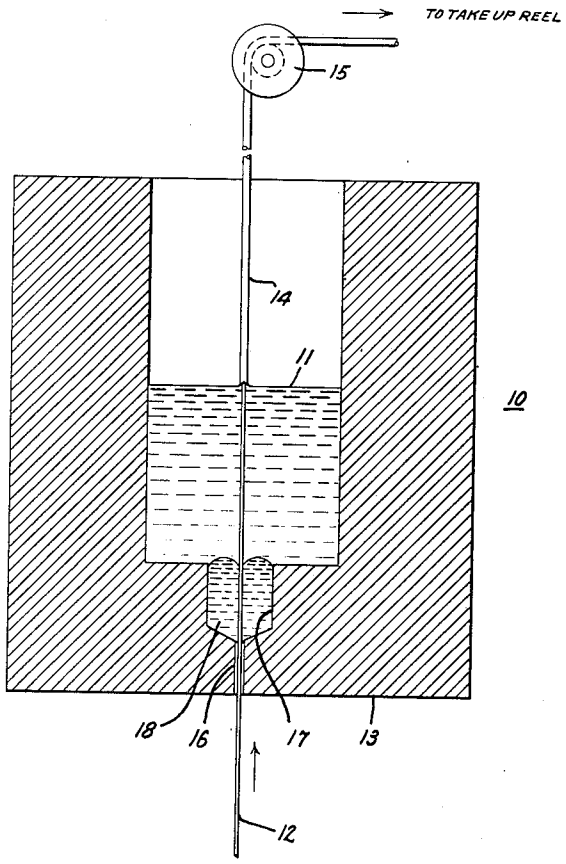

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WIRE COATING APPARATUS

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5 Claims. (Cl. 118—405)

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This invention relates to apparatus for coating wire and, more particularly, relates to a frictionless seal through which a wire to be coated may be introduced into a bath of coating material contained in a holding receptacle therefor.

At the present time, it is common practice to apply a coating of insulating material to a wire by drawing or pulling the wire vertically upward through a bath of the coating material. The wire is introduced into the bath through an opening in the bottom or base of the container, which opening must obviously also serve as a seal, so that the coating material will be retained in the container. Several types of seals have been employed to serve this function. For example, one of the simpler types has comprised a pierced rubber diaphragm which more or less hugs the wire as it passes therethrough, and thus serves to hold the liquid coating material within the container or receptacle. Another version of this type of seal is a gland with some appropriate stuffing material and an adjustable nut. However, these types of friction seals are in most cases objectionable in that they possess a well-known disadvantage. In the case where polytetrafluoroethylene dispersion or suspensoid, for example, is employed as a coating material, the dispersion coagulates in the area of the seal and precipitates out, usually as a small conical deposit around the wire immediately at the point of emergence from the seal. This cone tends to build up in size and periodically a slight protrusion on the wire picks up the cone, and it thereafter appears on the wire as a sizable bump. Wire thus coated, of course, cannot be tolerated and must be rejected. Attempts to prevent coagulation by eliminating the friction have been undertaken by providing an opening slightly larger than the wire or strip to be coated, which opening interconnects the space within the container or receptacle with another and smaller chamber below filled with a non-coagulable liquid, which must be miscible with the coating material. This liquid is retained in the lower chamber, however, by a friction-type diaphragm or stuffing-box arrangement through which the wire is drawn as it is pulled upwardly through the lower chamber, the opening leading into the main container and through the coating material therein. In addition, an elevated tank filled with the liquid is interconnected with the small chamber to provide a head so that the coating material will not flow through its bottom opening into the lower chamber and thereby coagulate at the bottom friction seal thereof. The liquid in the lower

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chamber must be miscible with the coating material since it will tend to be carried by the moving wire and, due to the head pressure, into the main receptacle. Aside from the fact that the liquid must be miscible with the coating material and must be periodically replenished, such an arrangement is complex, involves a number of parts to be maintained, and is relatively costly.

It is, therefore, an object of this invention to provide an improved and relatively simple seal for an opening in the bottom of a receptacle containing a liquid wire coating material.

It is a further object of this invention to provide a frictionless seal to retain liquid coating material in a container and through which a wire to be coated may be introduced into the container without frictional engagement with the walls thereof, and without any loss of coating material therefrom.

The invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims. In the drawing, the single figure illustrated shows a cross-sectional view through a container or receptacle 10 containing a liquid bath of a coating material 11 such as polytetrafluoroethylene for the insulation of wire such as 12. In practice, the wire 12 is drawn upwardly through an opening in the bottom 13 of the container, through the bath 11, whereby a thin layer 14 of the coating material is picked up by and thus supplied to the wire, after which the wire passes through an oven, not shown, then over a driving sheave 15. From the driving sheave 15, the wire is either recirculated through the coating material to receive additional layers thereof, or is wound on to a take-up reel. In accordance with the invention, the opening in the bottom of the container comprises a cylindrical passageway 16 in communication with the exterior of the receptacle and otherwise terminating inwardly in an enlarged recess 17 in the inner surface of the container. To plug or seal off the opening and thus prevent loss of the coating material therethrough, the recess is filled with a fluid 18, such as mercury, which is immiscible with the coating material and has sufficient weight or density to be retained in the recess. The portion 16 of the opening is sufficiently large to accommodate several sizes of wire with suitable clearance, so there will be no friction or rubbing action between the wire and the walls of the opening in the presence of the coating material. On the other hand, the portion 16 must

be sufficiently small so that the pool of mercury will not tend to flow therethrough or will be retained in the recess by virtue of its high surface tension characteristic. As a practical example of the relationship between a suitable size passage to the wire size, a passage 16 having a diameter of .032" has been employed to accommoderate wire ranging in size from .002" to .016" diameter. Although the upper portion or recess 17 in this case happens to have a diameter of $\frac{5}{32}$", it will be obvious that both the diameter and depth of this portion of the opening may vary within wide limits so long as there is no frictional engagement between the wire and the walls of the opening. It will be apparent that the mercury affords no rubbing action to precipitate the coating material in direct engagement or contact therewith, so that a seal has hereby been provided to retain the coating material, which seal is frictionless and requires no other structure such as a diaphragm or a stuffing-box arrangement.

While I have, in accordance with the patent statutes, shown and described a particular embodiment of my invention, it will be obvious that changes and modifications can be made without departing from the invention in its broader aspects and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Wire coating apparatus comprising a receptacle containing a bath of liquid coating material and having an opening through the bottom wall thereof, and a pool of mercury disposed within said receptacle adjacent said opening and sealing off the inner end thereof, said mercury being immiscible with and having a density greater than the density of said coating material, said opening being sufficiently large to permit free passage of a wire therethrough without engagement therewith and sufficiently small to prevent flow of said mercury therethrough.

2. Wire coating apparatus comprising a receptacle containing a bath of liquid coating material, the bottom of said receptacle having a recess in the inner surface thereof in communication with a restricted opening extending through said bottom to the exterior of said receptacle, and a frictionless seal to prevent flow of said coating material through said opening comprising a pool of mercury occupying said recess, said mercury being immiscible with and having a density greater than said coating material.

3. Wire coating apparatus comprising a receptacle having a bottom and side walls for holding a bath of liquid coating material, said bottom wall having a passage therein in communication with the exterior of said receptacle and terminating in an enlarged recess in the inner surface of said bottom wall, a pool of mercury being immiscible with and having a density greater than said coating material occupying said recess below said coating material, said passage being sufficiently large to permit free passage therethrough of said wire and sufficiently small so that the surface tension characteristic will retain said mercury in said recess, and means for drawing said wire through said passage, said mercury and said bath of coating material.

4. Wire coating apparatus comprising a receptacle having a bottom and side walls for holding a bath of liquid coating material, said bottom wall having a cylindrical passage therein having a diameter of $\frac{1}{32}$" in communication with the exterior of said receptacle, and terminating in an enlarged cylindrical recess having a diameter of $\frac{5}{32}$" in the inner surface of said bottom wall, a pool of mercury occupying said recess, and coating material bath of polytetrafluoroethylene dispersion immiscible with and having a density less than said mercury retained in said receptacle by said pool of mercury.

5. Wire coating apparatus comprising a receptacle having a bottom wall and side walls, said bottom wall having a restricted passage therethrough in communication with the interior and the exterior of said receptacle, said passage being sufficiently large to permit free passage therethrough of a wire to be coated, a pool of non-coating sealing fluid at the bottom of said receptacle surrounding the wire where it enters the receptacle from the passage, and a bath of liquid coating material with which said wire is to be coated after it passes through the sealing fluid and lying above but in surface contact with said fluid, said sealing fluid having a greater density than said coating material and being immiscible with it, whereby said sealing fluid is retained at the bottom of the receptacle beneath the coating material while the wire passes upwardly through the receptacle, and said sealing fluid further having a surface tension relative to the size of said passage and the size of wire to be coated sufficient to prevent egress of the sealing fluid from the receptacle through the passage, whereby said fluid forms a seal permitting substantially frictionless entrance of the wire into the bath of coating material while preventing loss of coating material through the wire entrance passage.

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