

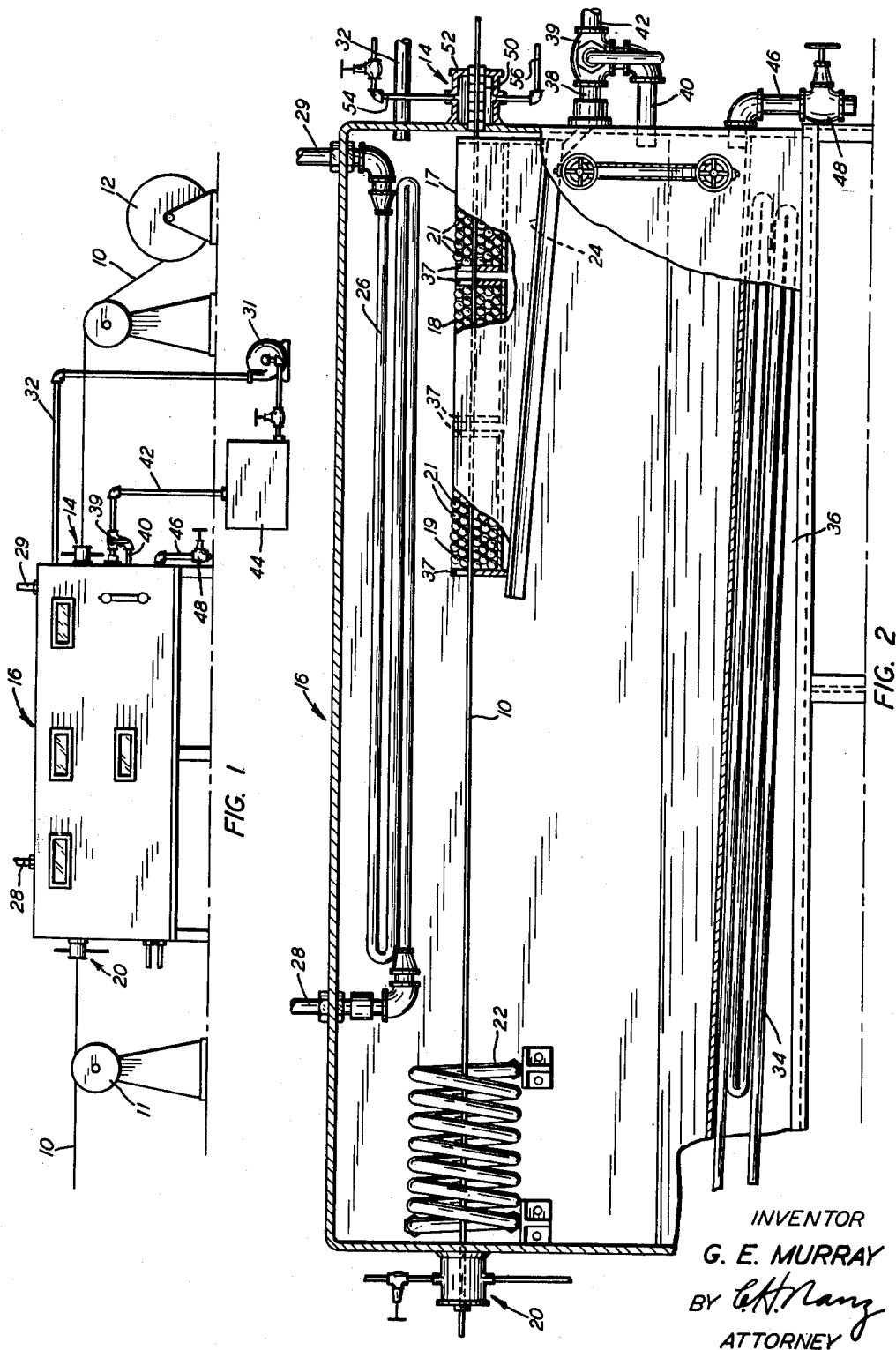
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METHODS OF CLEANING ARTICLES

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METHODS OF CLEANING ARTICLES

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This invention relates to methods of cleaning articles, and more particularly to methods of cleaning grease and other matter from metallic filaments preparatory to electroplating filaments.

In the manufacture of conductors by electroplating conductive material on metallic filaments, it is essential that the filaments be thoroughly cleaned before electroplating operations thereon are conducted. Heretofore there has been no simple, effective apparatus for cleaning filaments to prepare them for electroplating operations.

An object of the invention is to provide new and improved methods of cleaning articles.

An additional object of the invention is to provide new and improved methods of cleaning filaments in preparation for electroplating filaments.

A further object of the invention is to provide new and improved methods of dissolving grease and other substances on the surface of the filament in a solvent, and then mechanically scrubbing the article to remove any solid particles therefrom.

A method illustrating certain features of the invention may include advancing an article through a chamber, vaporizing a solvent in the chamber, and precipitating the vaporized solvent onto the article. Preferably, the article also is scoured while in the chamber.

A complete understanding of the invention may be obtained from the following detailed description of a method forming a specific embodiment thereof, when read in conjunction with the appended drawings, in which:

Fig. 1 is a front elevation of an apparatus for practicing one method embodying the invention, and

Fig. 2 is an enlarged, front elevation of a part of the apparatus shown in Fig. 1 with portions thereof broken away to reveal its construction.

Referring now in detail to the drawings, a conductor 10 is advanced by a capstan 11 from a supply reel 12 through an entrance condensing seal 14, a cleaning and degreasing chamber 16 and scouring pans 17, 18 and 19 (Fig. 2) mounted in the degreasing chamber and an exit condensing seal 20. The scouring pans are filled with glass balls 21—21, but also may be filled with steel balls, steel wool or other suitable scouring elements. The conductor is advanced through a drying coil 22 through which steam from a suitable source of supply is forced. A drip pan 24 is positioned beneath the scouring pans, and a cooling coil 26 located above the scouring pans extends from the entrance end of the chamber to a point near the coil 22. The cooling coil is supplied with cold water, which enters the coil through a pipe 28 and leaves it through a pipe 29.

A solvent, such as, for example, trichloroethylene or carbon tetrachloride, is pumped to the chamber 16 by a pump 31 through a pipe 32, and is maintained at a substantially constant level therein. A heating coil 34 positioned in a recess 36 formed in the bottom of the chamber 16 heats the solvent to the vaporization temperature thereof, and the vaporized solvent fills the upper portion of the chamber. The solvent is condensed on the coil 26, and drops onto the conductor 10 and into the scouring pans

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17, 18 and 19. The solvent overflows from the scouring pans 17, 18 and 19 through weirs 37—37, and drops into the drip pan 24 carrying grease from the scouring pans therewith.

The solvent and the grease drain from the drip pan 24 through a pipe 38 and a three-way valve 39. Normally, the valve 39 connects the pipe 38 to a return pipe 40, but may be actuated manually to a condition in which it connects the pipe 38 to a pipe 42 leading to a reservoir 44, and closes off the pipe 38 from the pipe 40. A drain 46 mounted at the lowest portion of the bottom of the chamber is connected to a valve 48, which normally is kept closed but may be opened to drain sludge out of the chamber 16.

The condensing seal 14 includes a baffled tube 50 having a water jacket 52 surrounding it through which cool water supplied by a pipe 54 and drained by a pipe 56 is forced. The cool water cools the baffled tube 50 to condense any solvent entering the tube from the chamber 16, which condensate drains back into the chamber. The exit seal 20 is identical with the entrance seal 14 in structure and operation, thereby preventing escape of the solvent from the chamber 16.

Operation

The conductor 10 is advanced continuously and successively through the seal 14, the scouring pans 17, 18 and 19, the space under the cooling coil 26 and between the pan 19 and the drying coil 22, thence through the drying coil 22 and the exit seal 20. The coil 34 vaporizes the solvent sufficiently to keep the chamber 16 filled with vaporized solvent, some of which is being condensed continuously by the cooling coil 26 and the seals 14 and 20. The solvent continuously drops from the coil 26 into the scouring pans and onto the portion of the conductor between the scouring pan 19 and the drying coil 22. The action of the glass balls and the solvent in the pan 17 cleans the worst of the grease off the conductor, and the grease is dissolved by the solvent. The solvent is returned to the bottom of the chamber by means of the drip pan 24, the pipe 38, the valve 39 and the pipe 40.

The movement of the wire through the glass balls continuously agitates them and the solution to keep the balls cleaned of grease and the grease in solution so that it is carried out of the pans 17, 18 and 19. Most of the grease is removed from the conductor in the pan 17, most of the remaining grease on the conductor is removed in the pan 18 and most of that still on the conductor is removed in the pan 19. Thus, the solvent in the pans 17, 18 and 19 becomes progressively cleaner from the pan 17 to the pan 19.

As the conductor leaves the pan 19, there may be a small amount of grease in the solvent remaining on the conductor, but vaporized solvent surrounding the conductor condenses on the conductor between the pan 19 and the coil 22, and the coil 26 drenches this portion of the conductor to wash all grease therefrom. As the conductor is advanced through the coil 22, the coil heats the solvent yet on the conductor to the vaporization temperature thereof and vaporizes it to dry the conductor, and the dry, clean conductor leaves the chamber 16 through the seal 20.

To clean sludge settled on the bottom of the chamber 16, advancement of the conductor is stopped, and the valve 39 is actuated to connect the pipe 38 to the pipe 42. The solvent in the chamber then is continuously vaporized and condensed onto the pan 24, and flows into the reservoir 44 to reclaim most of the solvent. The valve 48 then is opened, and the sludge on the bottom of the chamber 16 is flushed through the drain 46. The valve 48 then is closed, the solvent is returned to the chamber, and the cleaning process is started again.

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The above-described method serves to effectively clean grease and other foreign particles from the surface of the conductor so that the surface of the conductor is in excellent condition for electroplating operations thereof.

While the above-described method has been described as cleaning a filamentary type of article, it also is suitable for cleaning articles not of this type which can be advanced through the vapor-filled chamber by a conveyor of well known types.

What is claimed is:

1. The method of cleaning a conductor, which comprises advancing a conductor seriatim through a series of scouring pans, scouring the conductor in said pans, continuously flooding the scouring pans with a liquid solvent, vaporizing the solvent, condensing the solvent vapor on the conductor after it leaves the scouring pans, precipitating a portion of the vapor above the conductor so that drops of solvent fall onto and drench the advancing conductor, and then heating the solvent on the conductor to dry the conductor.

2. The method of cleaning metallic filaments, which comprises advancing a filament along a predetermined path, simultaneously scouring and applying a liquid

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solvent to the filament, then advancing the filament through an atmosphere of vaporized solvent, condensing the solvent vapor onto the filament, precipitating solvent vapor above the filament so that drops of solvent fall onto and drench the advancing filament, and then heating the filament to dry it.

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