

UNITED STATES PATENT OFFICE

2,546,115

METHOD FOR MANUFACTURING INCANDESCENT MANTLES

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No Drawing. Application April 22, 1949,
Serial No. 89,148

7 Claims. (Cl. 67—100)

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This invention relates to incandescent mantles, and it is the object of this invention to provide a new and improved method for producing incandescent mantles.

Another object is to provide a method for producing incandescent mantles wherein economies are practiced with respect to material consumption and waste formed during the processing steps.

Briefly described, incandescent mantles are manufactured by the impregnation of a web or stocking knit of cotton, rayon, or other combustible organic fiber with a mantle fluid that ordinarily consists of an aqueous solution of rare earth metal salts, usually selected of the materials such as thorium and cerium nitrates. After the impregnated web has dried on a specific form, it is ignited to burn out the combustible fiber and other flammable material, leaving the corresponding metal oxides as an integrated but fragile skeleton.

Preliminary burning of the type described is usually followed by final burning or calcination, wherein a direct flame is played upon the burned out skeleton while being formed to desired shape. The product is then prepared for market by treatment with a collodion solution which, when dried, functions as a stiffening and integrating agent, strengthening the mantle, better to resist the destructive forces to which the mantle might be subjected as an incidence to normal handling until it is placed in position of use.

The mantle fluid usually consists of a 14 to 28 and sometimes up to 50 percent solution of the desired combination of metallic salts. When composed of thorium and cerium salts, the latter component ordinarily comprises from 1 to 5 percent by weight of the amount of thorium. Impregnation of the stocking is made by any of the well known methods, including dipping or flow-coating with or without the use of pressure or vacuum means.

During the burning and sintering steps, considerable shrinkage takes place; usually the stocking is reduced to about one third its original dimension. Most of the shrinkage occurs during the preliminary burning step and a smaller amount takes place during the calcinating and shaping step. This great amount of shrinkage and loss of strength resulting from burning out of the supporting fiber poses many problems which influence the manufacturing technique.

Shrinkage of the type which takes place in the burning out of the fibers and calcinating of the resultant product naturally reduces the in-

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terstice between the strand. To get sufficient openness in the skeleton or mantle for proper incandescence upon reaction with heat, it is desirable to start with a knit fabric having a very loose stitch. High shrinkage of the type heretofore secured often causes excessive distortion of the resulting skeleton in preliminary burning, making it very difficult to reshape the skeleton during calcinating. In the past, the amount of irregular shapes, such as cause insufficient lighting of finished mantles, which occurred during the steps of shaping and calcinating the mantles has led to losses amounting to an average of about 13 percent.

Many attempts have been made to impart greater mass integrity and stiffness to the stocking before and after preliminary burning. In most instances the disadvantages which follow such modification do not adequately compensate for the benefits achieved. For example, desirable stiffness might be secured by the addition of starch to the mantle fluid or the stocking, but the consequent adhesion of the mantle to the form on which it is shaped, leaves an undesirable process.

I have found that these objectionable features are obviated and the objects of this invention are achieved when the combustible fibers are impregnated with thorium and cerium salts and glyoxal. Glyoxal has the very desirable effect of stiffening the stocking before burning and markedly reducing the shrinkage of the stocking during the burning and calcination steps. Such reduction in shrinkage is important. It permits the use of smaller stockings with the consequent savings in material.

Important also is the noticeable influence which glyoxal has on the stiffness and shape of the stocking and of the burned and calcined mantle. Coupled with the characteristics which provide for less shrinkage, the increased integrity causes less distortion in burning, so that the product of the preliminary burning corresponds more closely to the form upon which it is to be disposed for calcinating. By the use of glyoxal, the loss of mantles during processing is reduced from 13 percent to considerably less than 8 percent, in most instances.

The desirable amount of glyoxal is deposited in the fiber from a solution containing 0.5 to 4 percent by weight of glyoxal solution, usually supplied as a 30 percent concentration. When calculated on the solids basis, a desirable impregnating composition contains 0.15 to 1.2 percent glyoxal or 0.5%-8.5 percent by weight of the

rare earth metal salts deposited on the fibers. Glyoxal may be used in greater amounts to compensate for the characteristics of various types of fibers which may be used, but the benefit of increased amounts is not fully compensated by the greater cost. In the main, shrinkage is reduced by about 10 percent where the designated amounts of glyoxal is used with a stocking fabricated of viscose rayon.

The desired effect, that is the reduction in shrinkage and better shapes of the skeleton may be secured by the impregnation of the fibers by glyoxal, independent of the mantle fluid, but it is more expedient to incorporate the glyoxal with the mantle fluid for impregnation of the stocking or web in a single step.

When glyoxal is incorporated into the mantle fluid to constitute a single treating composition, a stable medium is secured because the glyoxal solution is compatible with the mantle fluid.

By way of illustration, but not by way of limitation, the following examples are given to show how my invention may be practiced.

Example 1

A rayon stocking, the fibers of which are impregnated with a solution containing 0.75 percent by weight glyoxal in isopropyl alcohol or water and dried, is cut to about 11½ inches in length and 1¾ inches in width. The knitted sleeve is dipped into an aqueous mantle solution, containing 14-28 percent thorium and cerium nitrate, and then stretched over a conically shaped form to dry, after being allowed to stand for a period of 4 to 6 hours. The dry stocking, having some degree of stiffness imparted by the solids of glyoxal and the metallic salts, is removed from the form and burned while being freely suspended.

In this preliminary burning, practically all of the combustible material is consumed, leaving the corresponding metallic oxides as the reaction product in skeleton form shrunk to a fraction of the original dimension of the stocking, but with less overall shrinkage than that secured by the burning of the same materials in the absence of glyoxal. The flame of a shaped internal burner is directed into the skeleton to round out the shape of the skeleton, shrink it to final or permanent size, and burn out all remaining combustibles. Following the latter calcination step, the skeleton is immersed in a collodion solution and air dried.

It should be pointed out that instead of collodion, other resinous materials in solvent solution may be used, limited only by the necessity for ready combustibility; when in position of use, to leave the mantle free for its intended use.

Example 2

A stocking, loosely knitted of rayon yarn is washed with water to remove impurities and then dried. The dry stocking is immersed in an impregnating solution composed of mantle fluid having about 2 percent by weight glyoxal in 30 percent solution. The impregnated stocking is allowed to stand for a period of 4-6 hours. It is then cut to desired length and stretched over a metallic form of the desired conical shape and thereafter it is subjected to drying at a temperature of about 70° C. The dried and impregnated stocking is removed from the form and burned

and calcined, whereupon it is dipped in collodion, again dried and cut to length to fit the mantle mounting.

Instead of impregnating the stocking with a composition consisting of 2 percent by weight glyoxal in 30 percent solution, the stocking may be impregnated with the desired mantle fluid having an 0.5 to 4 percent glyoxal solution, depending upon the characteristic of fiber of which the stocking is formed.

While best results are secured by the use of glyoxal with stockings formed of rayon, it will be understood that shrinkage and stiffness are desirably influenced by the use of glyoxal with other combustible fibers such as cotton and silk. It will be further understood that numerous changes may be made in the formulations with respect to amounts of materials, their method of application and in processing steps without departing from the spirit of the invention, especially as defined in the following claims.

What is claimed is:

1. The process of manufacturing incandescent mantles wherein the fibers of carbonizable material of which the mantle is formed is treated with a composition containing glyoxal for the purpose of reducing shrinkage upon combustion.

2. In the process for producing incandescent mantles by the carbonization of fibers of which the mantle is formed while impregnated with mantle fluid, the step of treating the fibers with a composition containing glyoxal for the purpose of reducing shrinkage upon combustion.

3. The process of manufacture as claimed in claim 1, in which the glyoxal and mantle fluid comprise a single impregnating composition constituted with 0.5-4.0 percent by weight of 30 percent glyoxal solution.

4. The process of manufacture as claimed in claim 7, in which the fabric is first impregnated with glyoxal and then with the mantle fluid.

5. In the process of manufacturing incandescent mantles, the step of impregnating the carbonizable fabric of which the mantle is formed with a mantle fluid containing 0.15 to 1.2 percent by weight of glyoxal.

6. In the process of manufacturing incandescent mantle, the step of impregnating the carbonizable fabric of which the mantle is formed with a mantle fluid after the fibers of the fabric have been impregnated with a 0.15 to 1.2 percent glyoxal solution.

7. In the process of manufacturing incandescent mantles, the step of impregnating a formed carbonizable fabric with a mantle fluid containing glyoxal prior to burning off, said glyoxal being present in the fabric in an amount ranging from 0.5 to 8.5 percent by weight of the rare earth metal oxides in the mantle fluid.

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