June 24, 1930. J. K. WIRTH 1,767,421

METHOD OF PRODUCING CHEMICALLY STABLE ARTICLES

Filed Nov. 19, 1925

Fig. 1

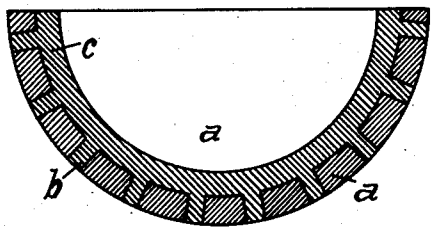


Fig. 2

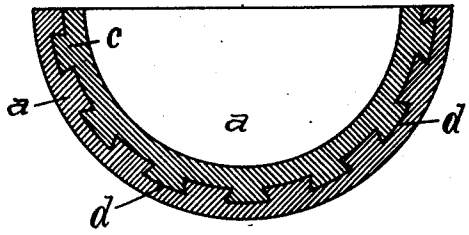
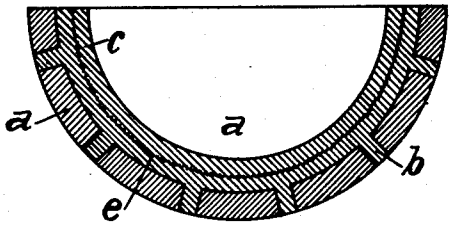


Fig. 3



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METHOD OF PRODUCING CHEMICALLY STABLE ARTICLES

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It is known to cover vessels, apparatus, or other articles with resin-like condensation products of phenols and aldehydes by applying to them a layer of condensation product which can be hardened and then converting this layer into an insoluble and non-fusible condition by heating. This method possesses the disadvantage that stresses are produced in the layer of condensation product during hardening in consequence of shrinkage or the like, and these stresses sooner or later affect the adhesion of the layer to the base. This disadvantage occurs when the layers are comparatively thin. It is noticed to a greater degree when the layers are thicker or the articles are large and particularly when the articles in question are subjected to varying temperatures in use.

In accordance with the present invention this disadvantage is avoided in the manner hereinafter described.

First the foundation to be coated, for example, metal sheets, tubes or other articles, is provided with perforations, notches or the like at suitable distances apart. The distance apart and the size and form of the holes, notches or recesses in the base may differ and will be selected to suit the conditions. The base thus prepared is coated with a condensation product by covering the surface with the condensation product and filling the perforations or the like therewith. These perforations or the like may be completely filled or only partly filled with the condensation product. When the layer thus formed is hardened a coating is produced which is anchored to the base by means of the portions extending into the holes or notches or recesses. The coatings thus produced, even after long use, still remain exceedingly strong and durable. They adhere well and are free from cracks.

In forming the coating there is used a plastic mass which consists of a suitable liquid or dissolved resin-like condensation product of phenols and aldehydes with which are preferably admixed suitable fillers. There may be used as fillers pulverulent, granular or fibrous admixtures. The most suitable fillers are chemically stable materials, such as quartz powder, asbestos fibre, chamotte powder or the like. Other additions, however, such as cellulose fibres or the like may be used. A particularly suitable filler is the dust produced in grinding articles of hardened phenol aldehyde condensation products or the waste of such objects otherwise broken up.

For the purpose of increasing the heat conductivity there may be added to the condensation product used for forming the covering graphite powder or other suitable heat conductor. There may be applied to the layer of resin-like condensation product inserts of fine-meshed or wide-meshed fabrics. Thus, for example, asbestos paper, asbestos fabric, metal cloth, jute, paper or like gauzes may be used. Fillers and fabric insertions may be used together.

The base to be coated may be varnished, before the formation of the coating, with a phenol-aldehyde-resin which can be hardened or the base may be first coated with another suitable layer. The layer of varnish or lacquer above referred to may be hardened by heating before producing the coating. This step, however, is not always necessary. In many instances the layer of lacquer may be hardened simultaneously with the main covering.

The coating may be formed from plastic material by kneading, stamping, rolling, cold or hot pressing, or by any other suitable method. The coating may also be composed of several layers. Moreover, in the first place, a layer of condensation product may be formed, then a fabric insert applied and finally one or more layers of condensation product applied and the coating hardened in the usual manner by heating. If the covering is formed of a number of layers these layers may, if desired, be hardened successively.

To make specially strong coverings completely free from soluble or volatile materials the crust of the layer after hardening is removed by grinding, by means of a sand blast or in any other suitable manner, and the article thus treated is heated one or more times to temperatures up to 200° C. so as to drive off any volatile constituents still remaining in the material. Then the surface may be

impregnated or painted with a liquid fused or dissolved phenol-formaldehyde condensation product and the new condensation product introduced into the pores may be hardened in the usual manner so as to provide a surface free from pores.

Fig. 1 of the accompanying drawing shows a crucible constructed in accordance with the present invention. The crucible *a* consists of iron and is formed with perforations *b* or the like. These perforations or the like are filled with a mixture of insoluble and non-fusible condensation product made of phenols and aldehydes with fillers. In this way the inner surface of the crucible is coated with a layer *c* of such mixture.

Fig. 2 shows a crucible provided with grooves *d*. These grooves are filled in the same manner as the holes in Fig. 1 with a mixture consisting of condensation products of phenols and aldehydes with fillers, the surface also being coated with this mixture.

Finally, Fig. 3 shows a crucible provided with perforations covered with a layer *c* of a mixture of condensation product and filler. In this layer is incorporated an insert of fabric *e* consisting of asbestos, wool, cotton, metal cloth or other material.

The method is not limited to the construction of crucibles, but various articles may be covered in this way as, for example, vats, stirrers, tubes and other objects.

The method, moreover, is not limited to the covering of the interior of such articles. Both the outer and the inner surface may be coated. Finally, the method is not limited to the form and dimensions of the holes or recesses, which can be suitably selected according to the purpose in view.

I claim:

1. In the manufacture of vessels of phenolic condensation products, of such size that they cannot be practically pressed in a mold, the process of preventing the shrinkage inherent in the unpressed phenolic condensation product, comprising providing a skeleton of metal having suitably spaced interstices, with the edges of which the phenolic condensation product may interlock, spreading a soft plastic mixture of liquid phenolic condensation products with fillers without pressure onto the metal skeleton in such a manner that the interstices become filled with a mixture and the surface becomes coated with it, then hardening the phenolic condensation product by the application of heat, removing the outer skin of the hardened coating, heating the vessel thus treated, to temperatures up to a limit of about 200° C, then applying to the surface a layer of phenolic condensation products and finally hardening the latter.

2. In the manufacture of vessels of phenolic condensation products, of such size that they cannot be practically pressed in a mold, the process of preventing the shrinkage inherent in the unpressed phenolic condensation product, comprising, providing a skeleton of metal having suitably spaced interstices, with the edges of which the phenolic condensation product may interlock, spreading a soft plastic mixture of liquid phenolic condensation products with fillers together with an inserted layer of fabric, without pressure onto the metal skeleton in such a manner that the interstices become filled with the mixture and the surface becomes coated with it, then hardening the phenolic condensation product by the application of heat, removing the outer skin of the hardened coating, heating the vessel thus treated to temperatures up to a limit of about 200° C., then applying to the surface a layer of phenolic condensation product, and finally hardening the latter.

3. A method of producing chemically stable articles consisting in providing such articles with depressions, filling the latter with a mixture of a condensation product of phenols and aldehydes with fillers, coating the surface with a layer of this mixture, hardening the condensation product in situ by heating, removing the outermost skin of the hardened coating and heating to temperatures up to 200° C. then applying to the surface a layer of phenol-aldehyde condensation product and finally hardening the latter.

4. A method of producing chemically stable articles consisting in providing such articles with depressions, then applying a layer of fabric to the surface, filling the perforations or notches with a mixture of a liquid condensation product of phenols and aldehydes with fillers, coating the surface with a layer of this mixture, hardening the condensation product in situ by heating, removing the outermost skin of the hardened coating and heating to temperatures up to 200° C. then applying to the surface a layer of phenol-aldehyde condensation product and finally hardening the latter.

5. A method of producing chemically stable articles consisting in providing such articles with depressions, filling the latter with a mixture of a liquid condensation product of phenols and aldehydes with fillers, coating the surface with a layer of the condensation product and filler, applying a layer of fabric to the surface and then a further layer of condensation product and filler, and finally hardening the condensation product by heating, removing the outermost skin of the hardened coating and heating to temperatures up to 200° C., then applying to the surface a layer of phenol-aldehyde condensation product and finally hardening the latter.

6. A method of producing chemically stable articles consisting in providing such articles with depressions, filling the latter with a mixture of a liquid condensation product of phenols and aldehydes with fillers,

coating the surface with a layer of condensation product and filler, hardening by heating, applying further layers of condensation product and filler and hardening by heating, then removing the outermost skin of the hardened coating and heating to temperatures up to 200° C, then applying to the surface a layer of phenol-aldehyde condensation product and finally hardening the latter.

In testimony whereof I have signed my name to this specification.

JOHANN KARL WIRTH.