My invention relates to the manufacture of water-resistant abrasive products, and more specifically to a method of rendering water resistant an abrasive product which is initially water-absorbing and/or has an initially water-soluble or water-absorbing abrasive binder; and to the resulting product.

One of the objects of my invention is to provide a method of waterproofing abrasive articles which are normally not water-resistant, such waterproofing being applied to such articles after they have been taken from the regular production line—my process being a treatment supplemental to the completion of the article in its non-water-resistant form.

A further object of my invention is to provide a simple waterproofing method employing well known materials in a simple manner, without the use of complicated formulae, and wherein, preferably, no baking is required, the applied water-resistant medium being dried, if desired, at ordinary room temperature. Further objects of my invention are to provide a flexible, durable waterproofing agent which possesses an improved resistance and bond and which embodies properties requisite for its successful use without cracking or crumbling in operations in the presence of water; and to provide an article which is not subject to deterioration due to heat or age and which has waterproofing agents which do not soften when subjected to friction heat.

In accordance with these objects, my process may be applied to abrasive articles, such as abrasive sheet materials, which comprise an abrasive, such as silica, garnet, aluminum oxide, silicon carbide or the like, bonded to a suitable backing by an initially water-soluble binder. Such forms of abrasive sheet material are well known in the art, the most common binders of this type being glue or casein.

In referring to an initially water-soluble binder, I include binders or adhesives which absorb water, although they do not necessarily dissolve in cold water. Most glues, while they dissolve in hot water, do not dissolve in cold water, but have a tendency to absorb cold water, which often causes a swelling action especially detrimental to the binding properties of the glue.

For the backing, paper, cloth, wood fiber, or other flexible materials may be used, such as are commonly employed in the manufacture of abrasive products ordinarily referred to as sandpaper, emery cloth, garnet paper, etc. The article may or may not be sized before the application of my treatment.

As a waterproofing medium for such articles, I employ a suitable resinous material. I have discovered, however, that such material, even when applied as a protective coating over the entire surface of the article, cannot be solely relied upon for waterproofing. I therefore provide a treatment which first renders insoluble, and sufficiently non-water-absorbing for my purposes or "water-resistant", the initially soluble or water-absorbing binder, and then complete the waterproofing of the article, including the backing, by the application of the resinous material. By sufficiently non-water-absorbing for my purposes, I mean sufficiently water-resistant so that after the addition of the later applied resinous material, the article will not destructively attack the binder by seeping through the resinous material and causing swelling, as I have found does happen when the binder is not first treated. While the binder as insolubilized might absorb water and swell in the absence of the later applied resinous material, and therefore not provide in and of itself a sufficient waterproofing, if the binder is made sufficiently non-water-absorbing so that it is not destructively affected by water after the article has been coated with the resinous material, the binder has been made sufficiently non-water-absorbing for my purposes.

Binders above referred to may be rendered insoluble even in hot water and made generally non-water-absorbing as thus explained, by the action of a chromium compound, without harmful effect upon the amount or character of the bind—i.e., without making the adhesive brittle. My preferred process is to pass abrasive articles taken from the regular production line, and having, for example, a glue binder, through a bath of a solution of a chromium compound. Such solution may be applied in other manners, such as by spraying, brushing or swabbing. In practice, I have found very satisfactory a practically saturated solution of chrome alum in water. Other soluble chromates may be used, however, including sodium or potassium bi-chromate, bi-chromate of potash or other soluble chromium salts. My preference for chrome alum over the bi-chromates is based partly upon the superior drying quality of the chrome alum solution in the absence of light, or in poor light, such as may be encountered in factory conditions.

It is also possible to secure a similar hardening of the glue by treatment with ordinary alum, formaldehyde or betaformaldehyde. I have found, however, that ordinary alum is not nearly as efficient as the chrome alum, and the formalde-
hydres are less desirable both because of their expense and because of their obnoxious properties. After the application of the chromium compound or other solution, the article is preferably dried for a period of roughly one-half hour, at which time the article is ready for the further application of the protective resinous material which, when applied to the backing as well as the abrasive surface, increases the strength of the entire article in both dry and wet usage and insures a waterproofing of the entire article.

For application to the chromium-treated articles, the resin is diluted with suitable thinners and the articles may be passed through a bath of the solution to impregnate the entire article, or application may be made in other manner so as to provide either impregnation or a surface coating on one or both sides.

Of the resins available, I have discovered many are not practical for my use. Such synthetic resins at the phenolic resins, glycol, and vinyl resins tend to bury the abrasive when a coating is applied thereto. These resins also require varying amounts of baking after application in order to make them non-tacky. The phenolic resins in particular have a tendency to carbonize in the presence of heat and for this reason are objectionable.

In accordance with the object of simplifying my process, I utilize a synthetic resin which dries at room temperatures. Such a resin is a reaction product of cashew nut shell oil, an example of which is Harvel resin, available on the market. In practice, I dilute the Harvel resin with five parts of toluol by volume, although other diluents, such as alcohols and the like, may be used.

Toluol, however, is an especially suitable diluent because of its comparatively non-inflammable character, and its satisfactory drying characteristics.

Application of the diluted resin solution may be made and the article may then be dried. Such drying takes place without the application of heat in about one-half hour under normal conditions.

Long baking in ovens or heated rooms is unnecessary, and, in fact, any heating is apt to render the coating un-desirably hard and inflexible. As previously stated, the resin may be applied either by impregnation or by a surface coating. When the entire article is passed through a bath, the insoluble glue or casein binder is coated or impregnated with the water-resistant resin as well as the backing. At the same time the abrasive surface of the article remains desirably flexible.

The above described treatment results in a much improved product which fulfills the demands of the trade for a durable waterproof abrasive product, especially in its capacity for withstanding the effects of both water and of friction. In this respect, my product is comparable to commercial abrasive products having initially non-water-absorbing nitrocellulose bonding agents. However, my product is inherently less dangerous than products utilizing oxidizing oils or cellulose nitrate as waterproofing agents, and, in its preferred form, contains no corrosive or obnoxious ingredients. It will be noted that application of both the chrome solution and the resinous material may be made at ordinary temperatures if desired—in other words, it is or may be a “cold” process.

I claim:

1. A flexible abrasive product comprising a backing, an abrasive material bonded to said backing by an initially water-absorbing adhesive rendered water resistant by the action of a chromium compound, and having a protective coating of a resinous material which is obtained from cashew nut shell oil, said product having a life under wet usage comparable to abrasive products having initially non-water-absorbing nitrocellulose bonding agents.

2. The method of waterproofing an abrasive sheet material having an initially water-absorbing binder, comprising rendering said binder water-resistant by the action of a chromium compound, and applying to said chromium-treated material a protective coating of a resinous material which is obtained from cashew nut shell oil.

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