This invention relates to an improvement in coated abrasive products and methods of manufacturing the same. More particularly the invention is concerned with a method of making abrasive coated products wherein the abrasive grains are attached to a backing in a layer substantially one grain deep, as typified by sandpaper, and in which the secondary or sizing coating of adhesive is applied in the form of a powder rather than in liquid condition as has heretofore been the practice.

Our invention is well adapted to the manufacture of abrasive coated products wherein a heat hardenable resin or varnish is employed as the base or adhesive coating and is also adaptable to use with other types of adhesives such as glue.

As is commonly known, the manufacture of sandpaper usually involves the application of two coats of adhesive or binder commonly spoken of as the base or making coat and the sizing coat. For example, it is the usual practice to first apply a base coating of liquid adhesive such as glue or a liquid synthetic resin to the backing, sprinkle on the abrasive grain, and then add a secondary or sizing coating of liquid adhesive. The sizing coating usually consists of a solution of the adhesive used for the base coating thinned with solvent to a lower viscosity than that of the base coating.

A second method of making sandpaper, which is used particularly where fine grit abrasive grains are employed, comprises preparing a mixture of the grain with the liquid adhesive and then applying the mixture to the backing.

Both these older methods have the disadvantage that the tops or outer surfaces of the abrasive grains are more or less coated with the adhesive so that the coated product presents a somewhat smooth surface rather than the sharp edges of the uncoated grains. Furthermore, since the sizing coating must be thinner than the base coating, the application of a sizing coating in the usual way requires the removal of a relatively larger amount of solvent. The removal of this excess solvent lengthens the time required to dry the adhesive and where materials which require a relatively expensive solvent are used as in the case of phenolic resins, for example, the recovery of the additional solvent requires a large capacity of rather elaborate solvent recovery apparatus. The expense in such cases is further increased by the proportion of the solvent which is inevitably lost in a method of this character.

Our invention obviates these difficulties and has the additional advantage that certain embodiments of the invention are adapted to the process of curing wherein the coated fabric is wound into a roll to conserve space as described and claimed in a copending application by Frank J. Tone, Serial No. 756,994 filed December 11, 1934. The method of curing abrasive coated webs by winding them into rolls and heating is particularly valuable where a binder comprising a heat hardenable resin is employed because the curing is a time-temperature function which usually requires that the coated webs be heated for a comparatively long time in order that the temperature may be kept low enough to avoid weakening the fabric backing. Our process is particularly well adapted to this method of curing because it leaves the outer surfaces of the coated webs dry and non-adhesive and the product can be wound into a roll without causing trouble from the adhesive sticking to the back of the contiguous layer of backing.

While our invention is adapted to a number of variations, we will illustrate it with a few specific examples, it being understood that these examples are for the purpose of exemplifying the invention and are not limiting.

Example 1
Sized paper of the type commonly employed in the manufacture of sandpaper and designated as "130 pound cylinder stock" is coated with a layer of a normally liquid phenolic condensation product resin free from solvents by brushing on the resin. A thin coating of 60 grit silicon carbide abrasive grain is then sprinkled over the resin coating to form a somewhat discontinuous coating of grain of a character commonly spoken of as an "open coat." Pulverized phenol-formaldehyde resin in the so-called A stage is then sifted onto the abrasive coated surface, the excess powder being removed by inverting the coated paper. The product may then be cured for 30 minutes at a temperature of 300° F.

Example 2
Sized paper is coated with a layer of varnish comprising an oil-modified phenolic resin cut with toluol in the proportion of 40 parts of the resin to 60 parts of toluol. 60 grit silicon carbide is then sifted onto the varnished paper in excess, the excess removed, and the coated product is then lightly sprayed with furfural to moisten the exposed surfaces of the abrasive grains. A dry powdered A stage phenolic resin is then sifted onto the coated surface, the excess removed, and the product heated to remove the solvent from
the base coating and to first fuse and then heat harden the oil modified resin binder and the powdered sizing coating.

**Example 3**

A coating of a normally liquid phenol formaldehyd resin is applied to a backing and dry pulverized shellac is sifted onto the coated backing in excess, the excess being removed at once by inverting the coated backing. 30 grit fused alumina abrasive grain is then applied to the coated backing, the excess removed, and the article heated for 20 minutes at 300°F. The application of the pulverized resin to the liquid resin increases the depth of coating to the degree required to attach the #36 grit without applying an additional sizing coat.

**Example 4**

Paper is coated with 50 grit abrasive grain attached to the backing with a base coating of hide glue in the manner usual to the art. Pulverized fish glue is then sprinkled over the coated product which is then sprayed with a jet of water until the fish glue has melted and flowed to an extent sufficient to cause it to unite with the base coating of adhesive. The product is then dried in the usual way.

As is indicated by the examples, our method is adapted to be used with various types of adhesive materials. It is, for example, well adapted to be used in making coated products wherein the base coating and the sizing coating comprise different materials as illustrated in Examples 3 and 4. It also comprises a number of modifications such as the introduction of the step of moistening the surfaces of the abrasive grains prior to the addition of the sizing coating, either before or after the grains are applied to the backing.

As illustrated in Example 4, we also contemplate the addition of a material which is a solvent for the dry adhesive used as a sizing material after the sizing coating has been applied. This addition may be water, where glue is the sizing material, or it may be either a volatile or a reactive type of solvent such as furfural, where a synthetic resin such as a phenolic condensation product is used as sizing material. This embodiment of the invention is adapted to be used where the coated product is to be roll-cured, for example, as it provides a method of thickening or setting up the adhesives to an extent sufficient to permit rolling the coated web without displacement of the coating on the web or adhesion of the coating to the back of the adjoining layer of coated web.

Although our method is adapted to use with various types of backing material, in general we prefer to employ a backing which does not absorb the base coating of adhesive as we have found that if a backing of some sort is used, the surface of the backing is robbed of some of the adhesive, thereby reducing the effectiveness of the base coating, and at the same time fabric backings are weakened and embrittled by the impregnating adhesive.

Suitable non-absorptive backings are sized papers, metal sheets and the like. We have also found that absorption of resin adhesives can be substantially prevented by preliminarily coating fabrics such as paper or cloth with a thin coating of glue.

Numerous other modifications can be made in carrying out our invention as, for example, pre-liminarily heating or drying the coated product before applying the sizing coat or heating the grains to improve penetration of the base coating by the grains, without exceeding the bounds of our invention, the scope of which is defined by the appended claims.

We claim:

1. The method of making coated abrasive products which comprises applying to a backing a base coating of liquid adhesive, adding a thin layer of abrasive grains to the adhesive coated surface, and applying a sizing coating of dry powdered adhesive material, whereby the time necessary for drying the coated abrasive product is reduced and a substantial portion of the abrasive grains thereon remain with exposed edges.

2. The method of making coated abrasive products which comprises applying to a backing a base coating of a liquid comprising a normally liquid resin, adding a thin layer of abrasive grains to the adhesive coated surface, and applying a sizing coating of dry powdered adhesive material, whereby the time necessary for drying the coated abrasive product is reduced and a substantial portion of the abrasive grains thereon remain with exposed edges.

3. The method of making coated abrasive products which comprises applying to a backing a base coating of an oil base varnish, adding a thin layer of abrasive grains to the adhesive coated surface, and applying a sizing coating of dry powdered adhesive material, whereby the time necessary for drying the coated abrasive product is reduced and a substantial portion of the abrasive grains thereon remain with exposed edges.

4. The method of making coated abrasive products which comprises applying to a backing a base coating of a solution of adhesive in a volatile solvent, adding a thin layer of abrasive grains to the adhesive coated surface, and applying a sizing coating of dry powdered adhesive material, whereby the time necessary for drying the coated abrasive product is reduced and a substantial portion of the abrasive grains thereon remain with exposed edges.

5. The method of making coated abrasive products which comprises coating a surface of a backing with a liquid adhesive, applying a thin layer of abrasive grains to a backcoated adhesive material, moistening the exposed surfaces of the abrasive grains with a solvent for a dry powdered adhesive to be subsequently applied, and dusting on a sizing coating comprising a dry powdered adhesive material, whereby the time necessary for drying the coated abrasive product is reduced and a substantial portion of the abrasive grains thereon remain with exposed edges.

6. The method of making abrasive coated products which comprises attaching a thin layer of abrasive grains to a backing by a base coating of liquid adhesive, applying a sizing coating of dry powdered adhesive material and treating the coated product to cause the dry powdered sizing coating to become attached to the abrasive grains and to unite with the base coating of liquid adhesive.

7. The method of making abrasive coated products which comprises attaching abrasive grains to a backing by a base coating of liquid adhesive, applying a sizing coating of dry powdered adhesive material, and heating the coated product to cause the dry powdered sizing coating to become attached to the abrasive grains and to unite with the base coating of liquid adhesive.

8. The method of making abrasive coated products which comprises attaching a thin layer of abrasive grains to a backing by a base coating of liquid adhesive, applying a sizing coating of
dry powdered adhesive material and moistening the coated product with a liquid which is a solvent for the sizing material to cause the dry powdered sizing coating to become attached to the abrasive grains and to unite with the base coating of liquid adhesive.

5. The method of making abrasive coated products which comprises attaching a thin layer of abrasive grains to a backing by a base coating of liquid adhesive, applying a sizing coating of dry powdered adhesive material, moistening the coated product with a liquid which is a solvent for the sizing material to cause the dry powdered sizing coating to become attached to the abrasive grains and to unite with the base coating of liquid adhesive, and heating the coated product.

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