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RESINOID BONDED ABRASIVE ARTICLE

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This invention relates to resinoid bonded abrasive articles, and more particularly to grinding wheels having abrasive grains united by a resinoid bond.

There are various operations which require grinding wheels of definite structures and grades of hardness or special grinding characteristics, in order that they may operate satisfactorily and efficiently. In the operation of snagging a metal casting, for example, the grinding wheel is customarily supported on a swinging frame and the operator is required to hold the wheel against the casting under a sufficiently heavy pressure to insure an efficient cutting action. This method of grinding is fatiguing to the operator, and it is desirable that the wheel have such characteristics that the application of heavy pressure is not necessary. In other words, such a wheel should abrade the work freely and rapidly and have a soft cutting action, and yet it should be capable of resisting wear and of giving a long life of useful service.

This type of grinding wheel used on swing frame grinders, floor stands and the like has heretofore been made of abrasive grains united by a resinoid bond; and the primary object of this invention is to satisfy the above requirements and to provide a grinding wheel comprising a resinoid bond which may be readily manufactured and will be satisfactory and efficient in its operation. Further objects will be apparent in the following disclosure.

In the course of my experimentation, I have found that the cutting action of certain types of resinoid bonded wheels may be improved if the bond has hard rubber incorporated therein, and particularly hard rubber in the form of small granules intermixed with and cemented together by the heat hardened resinoid bond. Other ingredients may be advantageously included in the wheel mixture and particularly cryolite which has the peculiar property of making the bond more resistant to the frictional heat of grinding and otherwise providing beneficial characteristics. The rubber employed in this bond should be of the hard or completely vulcanized type and not a soft or incompletely vulcanized rubber. It is of the nature of ebonite and preferably in a powdered form, which is preferably of a fine size, such as will pass through a screen of 100 meshes to the inch, more or less.

A preferred form of grinding wheel which is well adapted for snagging and heavy duty purposes may be made in accordance with the following procedure and of the compositions specified.

The abrasive grains may be of crystalline alumina, silicon carbide, boron carbide or other suitable granular abrasive material. A desired quantity of these grains of suitable grit size may be mixed with a plastic resinoid bond composition capable of being hardened by heat to an infusible and solid condition, such as a "Bakelite" phenol formaldehyde condensation product or other material of equivalent properties. The relative amounts of bond and abrasive determine the grade of the wheel, and this may be widely varied. In accordance with this invention, I include in the bond a considerable amount of hard rubber granules, and this usually comprises from 5% to 50% by weight of the total bond. If cryolite is used, it may beneficially constitute from 1% to 40% of the bond. To make a wheel which will be satisfactory for snagging operations, one may use a composition comprising 82% of abrasive grains and 18% of bond. A satisfactory bond formula for making the snagging wheel comprises the following:

	Percent by weight
"Bakelite" resinoid.....	62.5
Cryolite.....	20.7
Hard rubber dust.....	16.8

A considerable amount, such as 25%, of the resinoid may comprise a "Bakelite" resinoid in liquid form, while the remainder may comprise dry resinoid powder. In this case, the liquid resinoid serves as a plasticizing medium for the purpose of molding the mass of abrasive grains, rubber dust, cryolite and resinoid. If desired, one may use other plasticizers, such as furfural or other required bodies which will not have detrimental properties in the final product. The relative proportion of plasticizer may be widely varied to give the required plasticity.

The rubber dust may be made by various procedures but preferably by compounding a mass of two parts by weight of smoked rubber with one part of sulfur and then heating the intermixed rubber and sulfur to a temperature sufficient to cause a substantially complete vulcanization thereof. After this has been done, the hard rubber body may be ground or cut by suitable machinery to form rubber particles of a required grit size, such as will pass through a screen having 100 meshes to the linear inch. The size of particle may be widely varied.

Various suitable fillers may be incorporated in this bond mixture as may be desired. One may use various organic fillers, mineral oxides, fibrous materials, etc., such as zinc oxide, ferric

oxide, clay, asphalt, beeswax, cotton, asbestos and other suitable materials. It will also be appreciated that various other fluorides such as apatite and calcium fluoride may be substituted for the cryolite. Each of these may be used in amounts ranging from zero up.

In the procedure of making the wheel, the abrasive grains may be wet with the plasticizing medium, such as the furfural or the liquid "Bakelite" resinoid. Then the dry rubber dust, the cryolite or other filler, if used, and the dry resinoid powder may be blended. Thereafter, the wet abrasive grains and the resinoid rubber composition may be mixed in a suitable mixing machine to make a required plastic mixture. The mass is shaped in a mold as desired, and it is pressed to a required density, such as 2.5 grams per cubic centimeter. Then the shaped article may be baked at a temperature, such as 140° C. or higher, which is sufficient to convert the resinoid to its final infusible hard condition.

Various procedures well known in the abrasive industry may be adopted for the purpose of compounding these ingredients, and forming a shaped article having the desired structure and grade of hardness. The composition of the bond may be widely varied to meet the special needs of any particular grinding operation. But in each case, it is desirable that this bond comprise essentially a considerable proportion of a resinoid capable of being converted to a hard infusible condition and a material amount of hard rubber dust, such as from 5% to 50% thereof, and preferably within the limits of 15% to 40%.

The rubber serves as an inert body of substantially no bonding characteristics, but it nevertheless imparts to the wheel peculiar properties which make it softer acting and more freely cutting than would be the case if the rubber were absent and replaced by the resinoid. The grinding action is materially different from that which would be had if one omitted the rubber and used that smaller quantity of resinoid which would make the wheel act as soft in grade as does the rubber resinoid wheel. If the resinoid were used alone in such a soft wheel, it would be present in too small an amount to give the required strength and the wheel would not stand up under the severe stresses of a snagging operation. The presence of the rubber particles serves to make the structure stronger.

It will also be appreciated that one may employ numerous types of resinoid in addition to

the phenolic condensation product above specified. That is, one may employ any fusible, potentially reactive, heat settable resinoid which is capable of being mixed with the abrasive grains in an initial unreacted condition and thereafter set by heat to a hard and substantially infusible body. The standard reagents suitable for this purpose are formed by the reaction of phenol and formaldehyde or their homologues. One may, however, use other resinoids, such as the phthalic glycerol type of resinoid, known to the trade as "glyptal", and these may be used in either liquid or powdered form together with any suitable plasticizer.

It will be understood that the above specified compositions and methods of procedure are intended to be illustrative and not employed in any limiting sense and that the invention comprises broadly the features hereinafter set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. An abrasive article comprising abrasive grains bonded by a resinoid bond containing prevulcanized, non-bonding, substantially non-resilient hard rubber particles interspersed therethrough.

2. An abrasive article comprising abrasive grains united as an integral body by means of a resinoid bond cured to an infusible condition and containing at least 5% of ebonite granules interspersed therethrough.

3. An abrasive article comprising abrasive grains united as an integral structure by a resinoid bond containing from 5% to 50% by weight of ebonite granules of a fine size interspersed therethrough.

4. An abrasive article comprising abrasive grains cemented together by a cured resinoid containing ebonite particles in amount from 5% to 50% by weight of the bond, together with from zero to 40% of cryolite granules.

5. The method of making an abrasive article comprising the steps of forming a mass of hard completely vulcanized substantially non-resilient rubber, comminuting the same, mixing the rubber particles with a resinoid and abrasive grains proportioned to form a bonded article, and thereafter shaping a body therefrom and heating the same under temperature conditions required to convert the resinoid to its final stage.

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