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METHOD OF MANUFACTURING ABRASIVES

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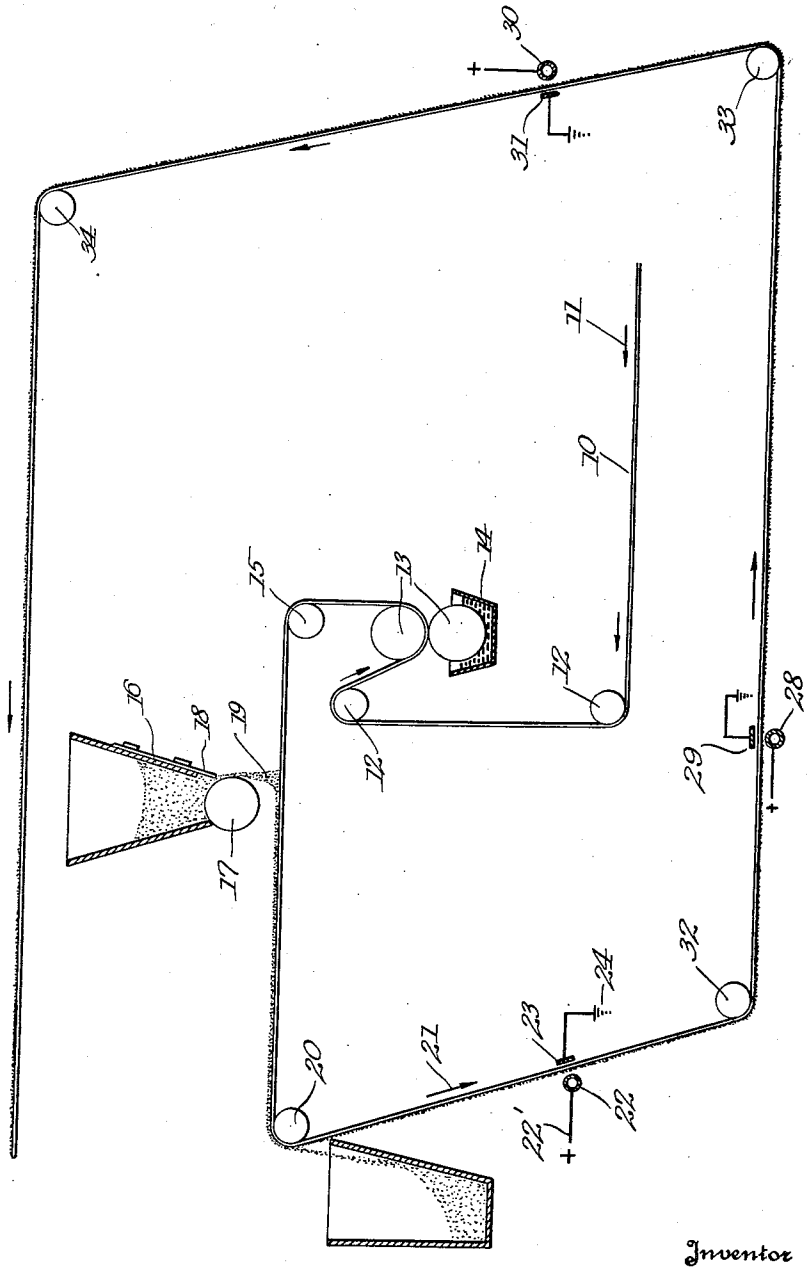

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UNITED STATES PATENT OFFICE

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METHOD OF MANUFACTURING ABRASIVES

Application filed July 14, 1930. Serial No. 467,931.

The present invention relates to abrasives, and more particularly to an improved method of manufacturing abrasives, such as sand paper.

The invention has as an object a novel method for controlling the disposition of the abrasive particles on their carrier and thereby producing a sharper and more efficient abrasive surface.

The invention seeks to provide a method for positioning or orienting the individual abrasive particles which form the abrasive surface so that the sharpest portion of substantially each particle will be exposed.

The method will be described in connection with the manufacture of an abrasive material, such as sand paper, although it will be understood that the invention is applicable to any type of abrasive material.

Abrasive paper, by which is meant any abrasive sheet or strip material having a surface of abrasive material, such as sand, ordinarily consists of a backing or carrier of paper or fabric, or combined paper or fabric, upon which the abrasive particles are retained by an adhesive. Usually the adhesive is applied to one surface of the carrier and thereafter the abrasive or cutting material is deposited on the adhesive surface where it is retained by the latter. The commonly employed particles are of irregular formation and ordinarily have one axis of greater dimension than the other, as well as surfaces which are sharper than other surfaces and, therefore, more suited for abradent action. It is desirable that these sharper surfaces be exposed to provide a relatively more efficient abrasive material. Moreover, the broader surfaces afford a more effective area for adhesively anchoring the individual particles to the carrier.

The present invention provides a novel method for producing this result and for arranging the particles so that their sharper portions are exposed and their broader surfaces adhesively joined to the carrier.

The invention involves the use of an electrical charge, produced by an electrical field which is preferably of electrostatic character, arranged to influence the individual particles so that each particle has exposed its sharpest and most effective portion.

In carrying out the method, a supply of sand may be arranged in a hopper above an adhesively surfaced carrier or backing. The hopper may be provided with the usual gate and feed roll for controlling to a certain extent the showering of the sand upon the adhesive surface to be coated, although the sand may be deposited upon the carrier in excess of the quantity desired. After the sand has been deposited upon the carrier, and any excess particles which are not required for forming the abrasive surface have been removed, the carrier is subjected to the action of an electrical field, preferably of electrostatic character. The electrical field is employed while the adhesive is not fully set and preferably before it is hardened to any appreciable extent. If the adhesive has hardened more than is desired it may be softened by the application of heat or by other means so that the action of the electrical field may produce the desired effect.

The electrical field is arranged so that the positions of the individual particles are changed to expose the sharpest portion of each particle. The electrical field is utilized by passing the abrasive surface therethrough and it has been found that there is obtained in this manner the proper orientation of each individual particle so that its sharpest portion is exposed.

It is believed that the field causes each particle substantially to align itself so that its longitudinal axis is virtually parallel to the lines of force of the field. The rate of discharge of an electrostatic charge is dependent upon the surface characteristics of the charged body and the longer the radius of curvature the slower the rate of discharge; the sharper the point, the faster the rate of discharge.

It is believed that this relation of the rate of discharge and the surface characteristics of the charged body, e. g. sand grain with a pointed abrasive portion, causes the sharpest points in the grains to be arranged so as to discharge in the direction of the field. If the field is at one side of the carrier, it follows

that any particles which are embedded in the adhesive in such a way that the sharpest points are not exposed will be turned or repositioned to cause the sharpest points to be directed to the electrostatic field and away from the carrier surface. Consequently, the many particles which do not have their points exposed when deposited upon the carrier will be oriented or changed in position by the action of the electrical field which exerts, in effect, a leverage upon the particles.

The location of the field in practicing the method will be dependent upon the "setting" of the adhesive. Rapid drying adhesive, such as lacquer, sets almost instantly and the field should be very close to the point where the sand is applied. Glue, on the other hand, requires a longer time to set, and varnish a still longer period. Therefore, the position of the electrical field may be altered according to the type of adhesive employed.

Moreover, the character or power of the field may be modified by modifying the position and size of the electrode, or changing the voltage. This phase of the invention need not be described in detail, since it is disclosed in my copending application Serial No. 296,323, filed July 30, 1928 which relates to a somewhat different process, but covers the broad idea of utilizing an electrical field for orienting the abrasive particles.

For practicing the method, various forms of apparatus may be employed.

In the accompanying drawing there is shown somewhat diagrammatically a suitable apparatus.

10 indicates the carrier or paper sheet which may be fed in the direction of the arrows 11 by suitable means (not shown) over guide rolls 12 and between coating rolls 13 which deposit a suitable adhesive from an adhesive container 14 upon one surface of the carrier. The coated surface, after passing over a roll 15, travels beneath a sand hopper 16 having a feed roll 17 and an adjustable controlling gate 18 for regulating the supply of abrasive material such as sand particles 19 to the exposed surface.

As illustrated in the drawing, the sand may be supplied in excess of the quantity required and at a roll 20 the carrier may take a sharp turn to provide a vertical run, indicated by the arrow 21, for the purpose of causing removal by gravity of the excess sand which has not been adhesively retained upon the surface. As will be understood, it is not necessary that this excess abrasive be applied and to control accurately the application of the abrasive, the gate and feed roll of the hopper 16 may be adjusted and other controlling means such as an electrical field of the character disclosed in my copending application may be utilized adjacent the hopper.

After the excess abrasive, if any, has been removed, the abrasive surface may be subjected to an electrical field. This field changes the positions of the individual particles, particularly of those particles which do not have their sharpest portions exposed.

The change of position of the various particles occurs in several ways: First, the particles which do not have their sharpest portions exposed are oriented or turned by the lines of force so that the sharper surfaces of the abrasive coating are exposed. Secondly, the various particles upon the surface are stratified, with the result that the larger or more effective particles are carried to the surface. As will be understood, in the manufacture of sand paper of any particular grade, the particles vary in size and will include both under-grade and over-grade sizes. The electrostatic field tends to carry to the top surface the larger particles, that is, the particles having the larger areas of cutting surface. Consequently, the change of position results from both orientation, i. e., turning of the particles so that their longest axes are parallel to the lines of force and to stratification, which results in the carrying of the larger particles to the surface of the carrier. The electrical field, which is preferably of electrostatic character, may be formed by a discharge electrode 22 connected by a lead 22′ to a source of high voltage (not shown). This electrode is disposed at the abrasive side of the carrier and cooperates with an electrode 23 grounded at 24 and disposed on the opposite side of the carrier for the purpose of forming a zero or ground potential side of the field. The field may be varied in intensity and extent as desired and it may be found desirable to vary these characteristics in accordance with the extent to which the particular adhesive employed has set and in accordance with different sizes or kinds of abrasive particles. It is possible, for example, to make a field of higher unit intensity by reducing the diameter of the tube 22, or a broader field, or one of lower unit intensity, by increasing the diameter of the tube. The proximity of the ground or zero electrode potential 22 affects the field.

As explained in my copending application, it has been found that by moving the tube 22, as by rotation, there will be produced a pronounced effect upon the character of the field.

At times it may be found desirable to subject the carrier repeatedly to the electrical field and for this purpose there may be provided a second electrical field produced by electrodes 28, 29 and a third field produced by electrodes 30 and 31 arranged in relation to the carrier in the same manner as the field first described. The carrier in passing through these fields for repeated subjection to electrical action traverses rolls 32, 33 and 34 and from the latter may be subjected to the usual finishing operations.

By the expression "adhesive action", and

"adhesively retaining" as used in the specification and claims with reference to the retention of the abrasive particles upon the carrier, is meant any means other than electrical for retaining the abrasive material on the carrier surface. By "abrasive" is meant any abrasive or coating material in fragmentary form; by "carrier" is meant any desired material or support on which the fragmentary or divided material may be imposed or deposited. Obviously, the method described in detail may be varied considerably without departing from the invention and apparatus considerably different from that illustrated and described may be employed for practicing the method, the essential characteristics of which are set forth in the following claims.

I claim:

1. In the manufacture of abrasives, the improved method which consists in providing a carrier having a surface of adhesive material adapted to retain abrasive material deposited thereon, applying finely divided abrasive material to said adhesive surface and after deposit of the abrasive, but while the adhesive is not fully set, changing the positions of the individual abrasive particles on said surface by progressively subjecting the abrasively coated surface to the action of an electrical field.

2. In the manufacture of abrasives, the improved method which consists in providing a carrier having a surface of adhesive material adapted to retain abrasive material deposited thereon, applying finely divided abrasive material to said adhesive surface and after deposit of the abrasive, but while the adhesive is not fully set, changing the positions of the individual abrasive particles on said surface by passing the abrasively coated carrier surface through an electrical field.

3. In the manufacture of abrasives, the improved method which consists in providing a carrier having a surface of adhesive material adapted to retain abrasive material deposited thereon, applying finely divided abrasive material to said adhesive surface and after deposit of the abrasive, but while the adhesive is not fully set, changing the positions of the individual abrasive particles on said surface by repeatedly subjecting the abrasively coated surface while the adhesive ly to electrical action.

4. In the manufacture of abrasives, the improved method which consists in providing a carrier having a surface of adhesive material adapted to retain abrasive material deposited thereon, depositing finely divided abrasive material on said surface in excess of the amount required to form the desired abrasive coating, removing the excess abrasive after depositing the same and then, while the adhesive is not fully set, changing the positions of the individual abrasive particles on said surface by progressively subjecting the abrasively coated surface to the action of an electrical field.

5. In the manufacture of abrasives, the improved method which consists in providing a carrier having a surface of adhesive material adapted to retain abrasive material deposited thereon, depositing finely divided abrasive material on said surfaces in excess of the amount required to form the desired abrasive coating, removing the excess abrasive after depositing the same and then, while the adhesive is not fully set, changing the positions of the individual abrasive particles on said surface by passing the abrasively coated carrier through an electrical field.

6. In the manufacture of abrasives, the improved method which consists in providing a carrier having a surface of adhesive material adapted to retain abrasive material deposited thereon, depositing finely divided abrasive material on said surface in excess of the amount required to form the desired abrasive coating, removing the excess abrasive after depositing the same and then, while the adhesive is not fully set, changing the positions of the individual abrasive particles on said surface by repeatedly subjecting the abrasively coated carrier to electrical action.

7. In the manufacture of abrasives, the improved method of treating a carrier having a surface coated with abrasive particles, adhesively retained on said surface, which consists in changing the positions of the particles by subjecting the surface while the adhesive is not fully set to the action of an electrical field at a point remote from the point of application of the abrasive.

8. In the manufacture of abrasives, the improved method of treating a carrier having a surface coated with abrasive particles, adhesively retained on said surface, which consists in changing the positions of the particles by repeatedly subjecting progressively the abrasively coated surface while the adhesive is not fully set to electrical action.

9. In the manufacture of abrasives, the improved method of treating a carrier having a surface coated with abrasive particles, adhesively retained on said surface, which consists in changing the positions of the particles by progressivley passing the abrasively coated surface through an electrical field.

10. In the manufacture of abrasives, the improved method of treating a carrier having a surface coated with abrasive particles, adhesively retained on said surface, which consists in changing the positions of the particles by repeatedly passing the abrasively coated surface through an electrical field.

In testimony whereof I have hereunto set my hand.

ELMER C. SCHACHT.

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CERTIFICATE OF CORRECTION.

Patent No. 1,854,071. Granted April 12, 1932, to

ELMER C. SCHACHT.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 52, claim 3, before the word "surface" insert the word carrier, and lines 52 and 53, same claim, strike out the words "while the adhesively" and insert the word progressively; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of June, A. D. 1932.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)