March 12, 1935. H. C. MARTIN 1,994,283

MANUFACTURE OF ABRASIVE PAPER

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Fig. 1.

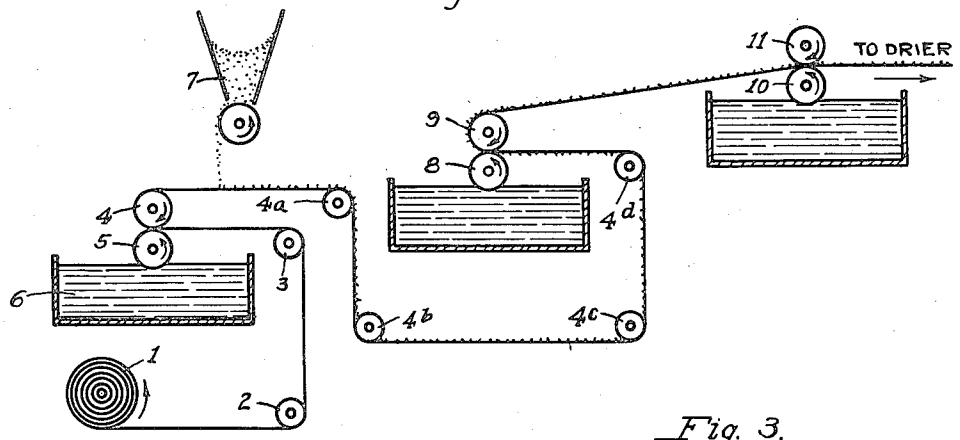


Fig. 3.

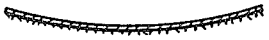
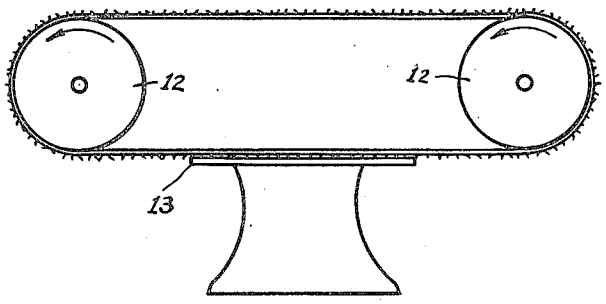


Fig. 2

Fig. 3A

Fig. 4.



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MANUFACTURE OF ABRASIVE PAPER

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In Canada June 13, 1929

6 Claims. (Cl. 51—278)

This application is a continuation in part of my copending application Serial No. 295,892 filed July 28, 1928.

My invention relates to abrasive coated surfaces such as abrasive paper and more particularly to abrasive belts or webs such as are used, for example, in polishing veneered surfaces.

One object of the invention is to provide a method for controlling the curvature assumed by open-coated abrasive paper as a result of the contractile force exerted by the coating. Another object is to provide open-coated abrasive paper which will remain flat or assume a curvature such that the abrasive coated side is convex. Other objects will appear as hereinafter set forth.

There are two basic types of abrasive-coated paper commonly designated as open-coated and close-coated. The latter of these is the type most commonly known and has been made for many years. Its properties are such that no difficulty has been experienced with it such as has been found in the more recently developed open-coated paper. It is a purpose of this invention to overcome this difficulty, which is inherent in open-coated paper and which materially retarded the adoption of this improved paper for many applications, particularly for belts or webs to be used in polishing veneered surfaces.

In the manufacture of close-coated paper, dissolved glue is applied to one side of a travelling web of paper by means of a cylinder which dips into dissolved or melted glue held in a receptacle and carries the adhering glue to the paper which contacts with the upper side of the cylinder. The coated surface of the paper is then carried under a feed device from which abrasive grains are dropped upon the coated surface. Thereafter, another layer of glue is applied to the abrasive surface to protect it, and the coated paper then passes on to the drier.

The coated surface of abrasive paper made by this method presents a practically continuous surface of abrasive grains, the grains being densely packed because an excess of grain is dropped onto the glue-coated web and because they adhere wherever they come in contact with the glue. Because of this dense packing of the abrasive grain, the paper is unable to curl in spite of the fact that the glue tends to shrink and thereby make the coated surface assume a concave curvature, since the contractile force of the glue is insufficient to crush or dislodge the abrasive grain. Consequently, abrasive-coated paper made by this method invariably remains substantially flat or, if it curls at all, it curls to present a convex abrasive face.

In accordance with United States Patent, No. 1,683,623 dated September 11, 1928, an improvement was made in abrasive-coated paper or cloth whereby the surface of the fabric was not completely covered with abrasive grains but instead was only partially coated, thereby leaving uncovered spaces between the grains. This so-called "open-coated abrasive paper" was found to have a number of advantages but it had a serious disadvantage not found in the full-coated paper previously used, in that the contraction of the adhesive on the coated side during drying caused the paper to assume a transversely concave form toward the abrasive side. In the use of such paper, for example as a sanding belt, the concave character of the belt causes sharp abrasive edges to be applied to the surface to be polished, and these cutting edges tend to injure or even cut through the veneered surface. The heat developed by the friction of the paper against the veneered surface also tends to aggravate this defect by causing increased contraction of the coating on the abrasive side.

I have invented a method which produces paper in which this injurious feature is prevented. The advantages of my invention result from the overcoming of the concave warping of the paper on the abrasive side.

In the drawing, which illustrates one preferred form of apparatus for carrying out my invention:

Figure 1 is a diagrammatic sectional side elevation showing one form of apparatus for carrying out my invention;

Figure 2 is a cross-section of ordinary open-coated abrasive paper;

Figure 3 is a corresponding section of one form of my improved open-coated abrasive paper;

Figure 3a is a corresponding section of another form of my improved open-coated abrasive paper; and

Figure 4 is a diagrammatic view illustrating one method of using abrasive paper in the polishing operation.

In practicing my invention, I provide means to counteract, oppose and compensate for the contraction on the abrasive side, and thus produce a paper which is either substantially straight in cross-section, or is convex on the abrasive side. This counter action, opposition and compensation can be accomplished by pro-

viding a contractile coating to the back of the paper.

Referring to Figure 1 of the drawing, 1 represents a roll of paper which is drawn through the drier and passes first over idle rolls 2 and 3 and thence between a pair of rolls 4 and 5, the latter of which carries a glue solution 6 from a receptacle onto one face of the paper. The paper when passing from roll 4 to idle roll 4^a receives a sparsely but uniformly distributed coating of abrasive grains from a feed device indicated at 7. Thence, the web passes over further idle rolls 4^b, 4^c and 4^d, and thence between a pair of rolls 8 and 9, the lower of which carries another glue solution onto the coated side of the paper.

The paper web is then reversed in position by a 180 degree turn in contact with the roll 9 and thence passes between another pair of rolls 10 and 11, the lower of which applies a coating of glue (the compensating coating) to the opposite side of the web from the abrasive-coated side. Any excess glue on the opposite side may be wiped off by a suitable means, if desired. The web then passes to the drying operation, during which the contraction of the glue taken up by the paper on the non-abrasive side serves to counteract the tendency of the paper to become concave on the abrasive side. The presence of the abrasive grains interrupts the continuity of the adhesive on the abrasive-coated side and hence tends to hinder the contraction on that side, so that it is not necessary for the glue on the non-abrasive side to have such a strong contractile effect as would be required were it not for these interruptions. Other factors being the same, the thickness of the glue coating, which determines the magnitude of the counteracting contractile effect, depends upon the sparsity of the abrasive coating which in turn determines the lengths of the portions of glue extending from one abrasive grain to another. The fact that there are larger areas of glue on the abrasive coated side in open-coated paper than there are in the ordinary close-coated paper is responsible for the fact that open-coated paper tends to assume a concave curvature while close-coated paper tends to remain flat or become convex since the magnitude of the contractile effect is increased by increase in the area of the uninterrupted glue surface.

The relative amounts of transverse contraction may be adjusted by using glues or glue solutions of different shrinkage characteristics for the compensating coating. By using a glue or glue solution of sufficient amount and of a relatively great degree of shrinkage on the back of the paper prepared in accordance with my invention, the article takes the form shown in Figure 3. In this case the contraction on the non-abrasive side has more than overcome the contraction on the abrasive side giving a convex surface on the abrasive side. On the other hand, the use, on the back of the paper, of a glue or glue solution having substantially the same contractile effect as the coating on the abrasive side leaves the paper substantially straight in cross-section. In either case, the danger of injuring the work due to the sharp edges of the old concave paper is avoided, but I prefer to employ a paper of the general type shown in Figure 3, since this acts to compensate for the tendency to contract on the abrasive side, due to the heat generated on that side during the use of the paper.

Because different brands of glue, the thickness of the glue coating, the size of the abrasive grains and the relative "openness" of open-coated paper all affect the magnitude of the contractile force, it is impractical to attempt to state the thickness of the contractile coating. This factor is readily determined by trial and when once determined for a particular combination of abrasive grain, glue and "openness" is duplicable. In general, I have found it convenient to use the same kind of glue for the contractile coating as is used for the adhesive, merely diluting the adhesive with additional water. The contractile coating is usually very thin, so thin in fact that it has very little adhesive power and is barely perceptible.

In Figure 4, 12 represents rollers over which the web of abrasive paper passes, with the abrasive on the outside of the web, and 13 represents a table to which the veneer is secured, so that in the movement of the web it will properly act upon the veneer or other surface to be polished.

The method may be varied, the apparatus may be varied, the adhesive employed may be changed, and in fact, any coating may be employed which will act to overcome the contraction on the abrasive-coated side, and other changes may be made, without departing from my invention.

I claim:—

1. An open-coated abrasive web having a discontinuous coating of abrasive attached to one side by an adhesive which exerts a contractile force and thereby tends to make the abrasive-coated side assume a concave curvature, and a non-abrasive side coated with a material having a different contractile effect than the adhesive on the other side but which exerts a counteracting contractile force substantially equal to the force exerted by the coating on the abrasive-coated side.

2. Open-coated abrasive paper comprising a discontinuously coated abrasive side and a non-abrasive side, the non-abrasive side being provided with a coating having a different contractile effect than the adhesive on the other side but which exerts a contractile effect sufficient to substantially equalize the contractile effect of the abrasive-coated side whereby the paper is made either plane or curved slightly convex on the abrasive coated side.

3. A new article of manufacture comprising a backing, coated on one side with a substantially continuous layer of adhesive and having abrasive grains so sprinkled on the adhesive-coated surface that the grains will lie haphazardly but with a substantially uniform density of distribution over the area of the sheet and applied so sparsely as to leave small irregular shaped uncovered spaces between the grains, and coated on the other side with a contractile coating having a different contractile effect than the adhesive on the other side but which exerts sufficient contractile effect to make the article either plane or curved slightly convex on the abrasive-coated side.

4. The method of manufacturing open-coated abrasive paper to counteract the contractile effect of the adhesive for securing the abrasive grains, comprising applying an adhesive and abrasive grains to one face of a backing and applying a coating of an astringent material only to the opposite side of the backing having a contractile effect of a predetermined degree suffi-

cient to counteract the contractile effect of the adhesive coating and abrasive grains on the other face of the backing to cause the abrasive face to be drawn to the desired position.

5. The method of manufacturing open-coated abrasive paper to counteract the contractile effect of the adhesive for securing the abrasive grains to prevent the abrasive face from assuming a concave curvature, comprising applying an adhesive and abrasive grain to one face of a backing and then applying an astringent coating only to the opposite side of the backing having a contractile effect of a predetermined degree to counteract the contractile effect of the adhesive coating and abrasive grains on the other face of the backing to cause the abrasive face to be drawn to a plane surface.

6. A new article of manufacture comprising a paper backing having on one side a substantially continuous layer of adhesive and having abrasive grains sprinkled on the adhesive surface so sparsely that the paper tends to curl and make the abrasive coated side assume a concave curvature, and means for counteracting such curling tendency consisting of a coating applied to the other side of the paper which exerts a contractile effect sufficient to overcome that of the adhesive coating.

HARRY C. MARTIN.